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20 tips to ensure a flawless installation

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MAY 2002

MINIMUM BS

Operation: Upgrade

How to identify & exterminate your PC's worst hardware bottlenecks

Complete upgrade paths for your 10 slowest parts

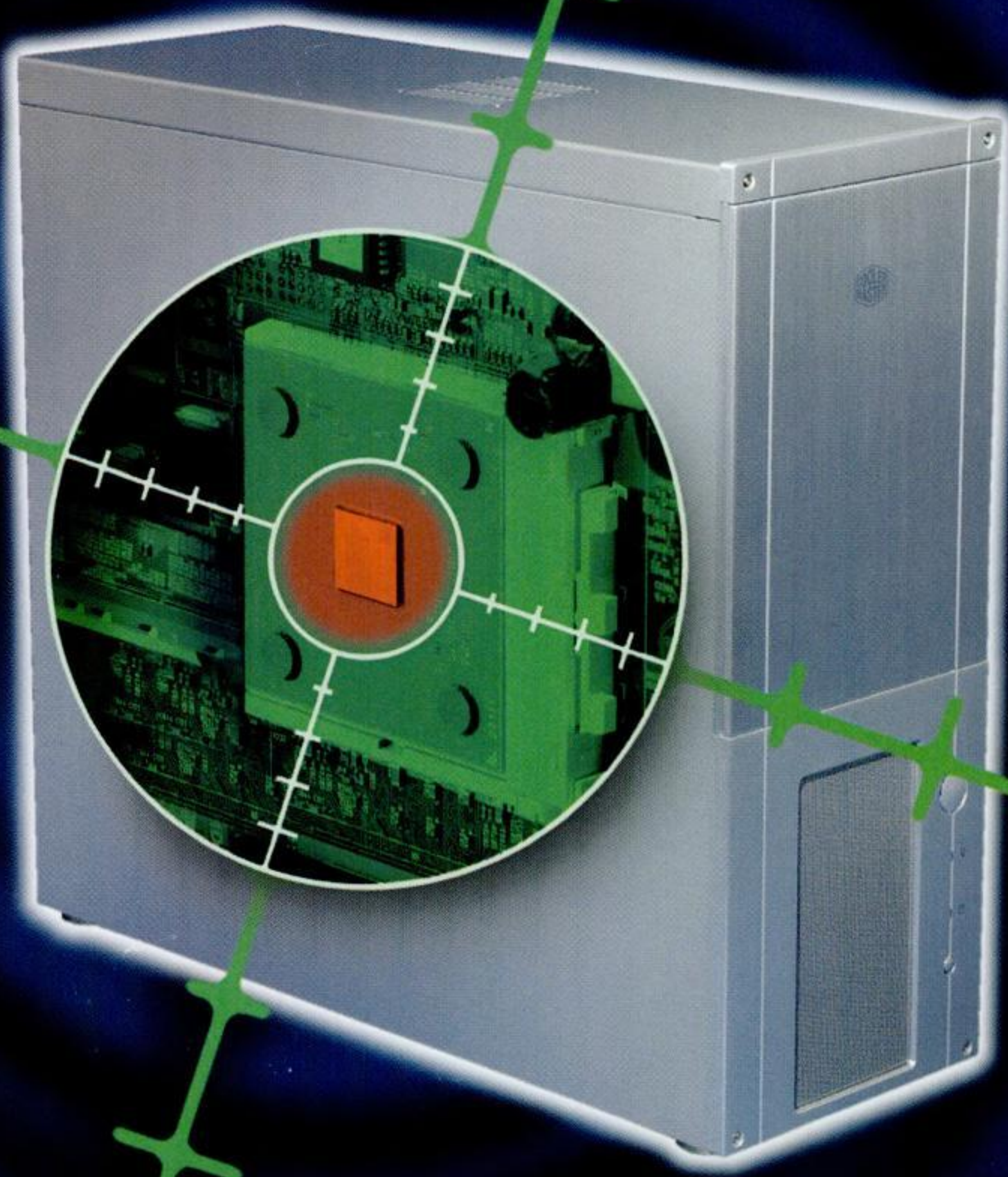


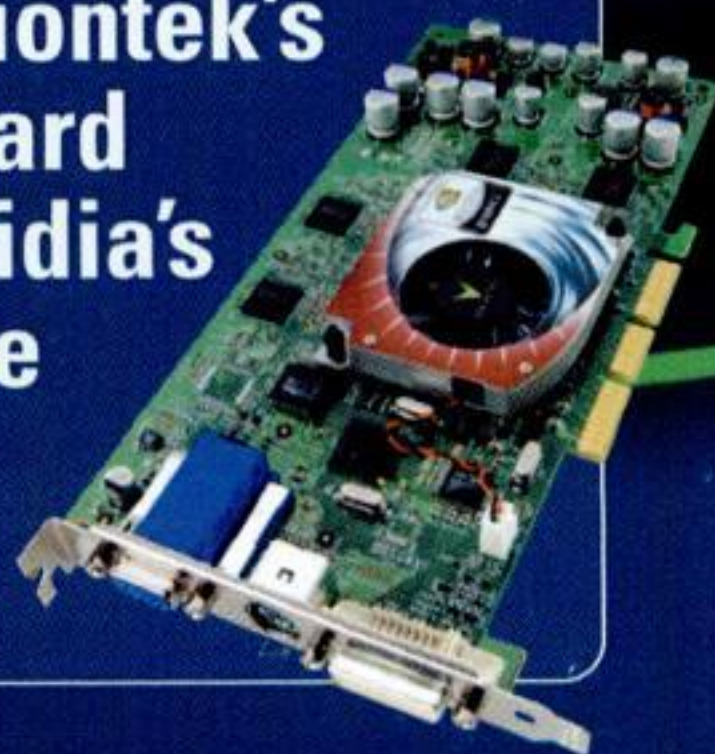
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Release Notes



Why nVidia and ATI Ought to Begin Sweating

Don't get me wrong: We think that every article in our modest little magazine is important. Our goal is to provide you with direct, tangible benefits in every single story. Sometimes this takes the form of benchmarking information that steers you toward the right upgrade. Other times this means troubleshooting tips to help you fix your busted box. And still other times, we just want to give you a good laugh so that reading *Maximum PC* is as enjoyable an experience as reading, say, your favorite romance novel, or that latest Tony Robbins self-actualization guide, or whatever other sick-puppy weirdness you happen to enjoy.

Yes, we deem every story in the magazine to be important, but once in a while a single story—oftentimes a little story—bears special significance. This month, that story can be found on page 16 in the lower right-hand corner: "Creative Labs Doubles Its Labs." We underplayed the news a bit because we have such scant information on Creative Labs' purchase of 3DLabs. But if the results of the buyout unfold in Creative Labs' favor, hardcore enthusiasts will get to witness a hardware dogfight that harkens back to the PC's "heyday" of the late 1990s. (Oh, those naughty '90s—if only today's youth could have lived in that bygone PC era!)

Imagine: A three-way battle for 3D dominance among nVidia, ATI, and Creative Labs. Readers, this could be *HUGE*. For starters, competition is always a positive force in driving technology forward, so we say the more the merrier. The two-way race between nVidia and ATI has become tiresome, if not a bit ticky-tack, with each company sniping the other in the shadow war for PC gamers' hearts and souls. Of course, that's what a company *should* do when fighting just a single competitor, but consumers benefit when more energy is spent on R&D—and that's exactly what should happen when a third powerhouse enters the consumer 3D hardware picture. And Creative Labs is a powerhouse if there ever was one. Before the birth of 3dfx, Creative Labs was the company that was most synonymous with PC gaming—you absolutely had to have a Sound Blaster soundcard if you wanted the best gaming experience possible. Today, Creative Labs has its soundcards in every OEM rig worth buying. That's called pull, and it will help propel the mysterious 3D chip that Creative and 3DLabs have simmering on the front burner.

But even more importantly, Creative's purchase of 3DLabs signals a possible sea change for the PC industry. Creative, after all, used to be a major purveyor of videocards, rebranding technology from 3dfx, S3, and other R&D houses. But then it abandoned the graphics market just as the entire PC industry was beginning to contract. Is Creative preparing for the next big wave of PC purchasing and upgrading? Everyone who reads this magazine has a vested interest in the answer.

—JON PHILLIPS

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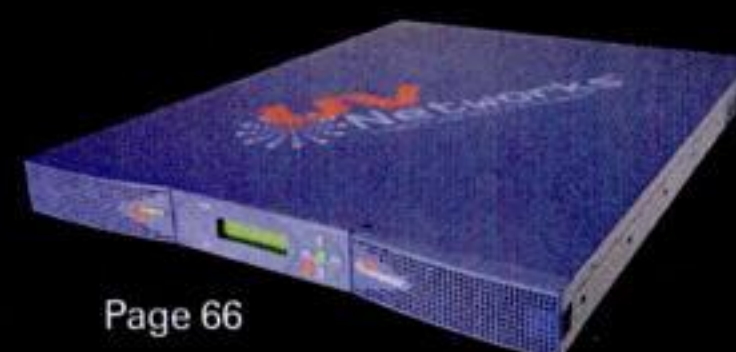
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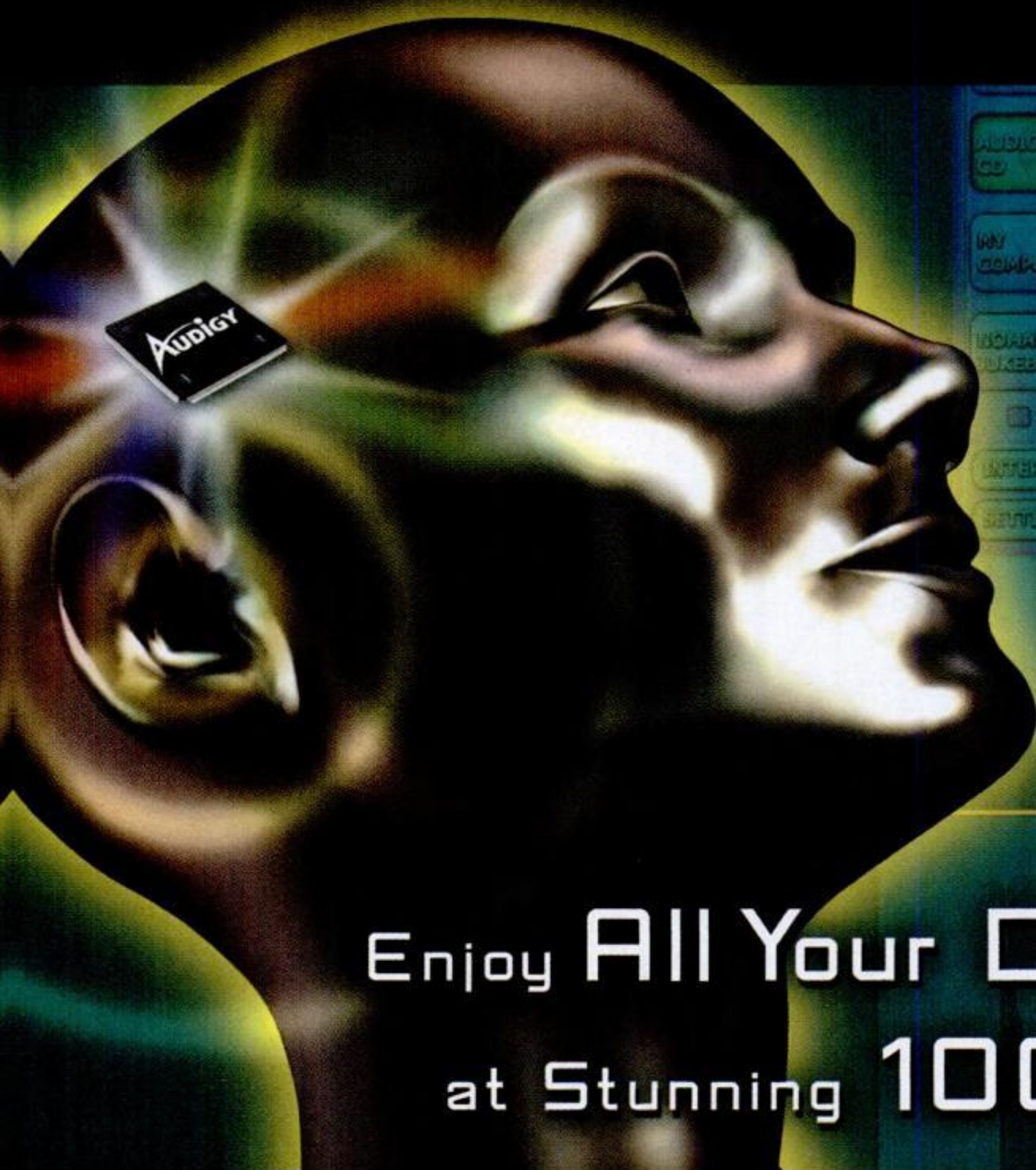
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MAXIMUM PC

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CREATIVE[®]

THIS MONTH'S FEATURES

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Targeting Bottlenecks

Are you getting optimum performance from your PC? Before answering yes, check out our comprehensive guide to all your PC's possible chokepoints.



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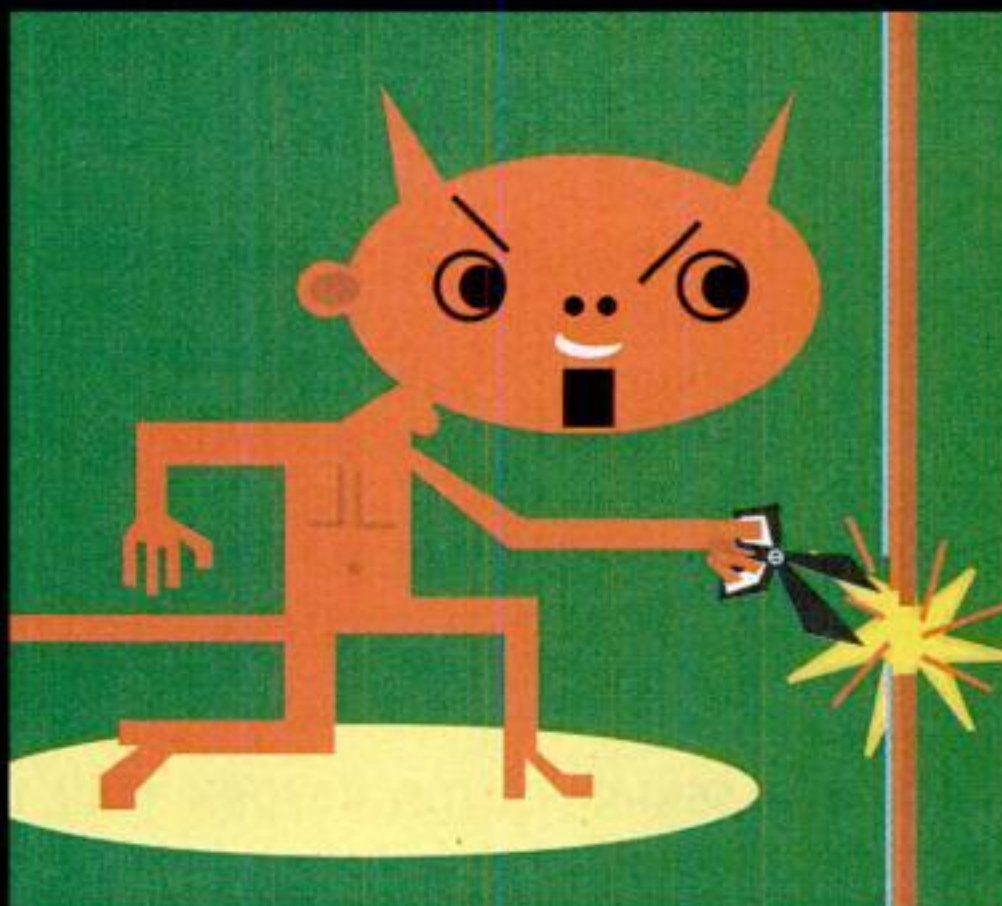
Photo Printers

We round up five different photo printers from five different vendors and compare how each performs at printing digital images. Get the picture?



50 DSL Q&A

Don't get trapped in DSL Hell! If you're even considering switching to a broadband Internet connection, read our 20 questions and answers on the subject. The information you get here will help you find a DSL provider that meets your needs.



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Step One: Hack Monitor. Step Two: Call Ambulance

My monitor started acting funny recently, going blank, turning off, making funny sounds. I noticed it was putting out a lot of heat, so I cut a hole in the top and mounted a fan. Voila! All better now. I guess it will keep it going a little while longer.

—ANDY FISHER

EDITOR-IN-CHIEF JON PHILLIPS REPLIES: Andy is one of the lucky ones. The conventional wisdom is that hacking into a monitor can leave you with a face full of electricity and shrapnel. In fact, your CRT display is the one PC component that should always be serviced by a true professional. Regardless, that's one classy duct-taping job, partner.



WHY NO NOTEBOOKS?

I enjoyed your article on the step-by-step process to "Build your Own PC" [March 2002]. However, I must express my disappointment in the lack of coverage about the notebook side of the industry. It seems the computer magazines' main focus is on the PC desktop, not the laptop, which has been increasing its market share. I would like to see a *Maximum PC* cover that reads, "How to Build Your Own Notebook." Many of us have used notebooks that are not quite up to snuff. I haven't done much work on laptops, but I'd like to gut my current one and replace everything with the best hardware I can install in it. So how to go about it? A little more attention to this subject would be greatly appreciated.

—ROBERT FORTIER

"I would like to see a *Maximum PC* cover that reads, 'How to Build Your Own Notebook'."

EDITOR-IN-CHIEF JON PHILLIPS REPLIES: For all intents and purposes, there's no market for do-it-yourself notebook building. You can upgrade memory, hard drives, optical drives, batteries, and all the components that run via the mini-PCI slot, but building your own notebook is pretty much out of the question.

Notebooks are more highly engineered than desktops. Because they're designed to

pack so much performance into such a small space, their particulars are extremely proprietary, and fit together like a jigsaw puzzle. For this reason alone, building a notebook from scratch is just plain out of the question—a "build-it-yourself" parts market just doesn't exist. But more importantly, notebooks are built according to very strict heat tolerances that are tested and retested by the OEMs. If you were an aftermarket parts manufacturer, would you really want to deal with all the support calls and product returns from people who fried their notebooks or simply couldn't get everything to work without crashing?

That said, a notebook upgrading story is long overdue. Some parts in some notebooks can be upgraded in some instances. We'll do our best to accommodate notebook fanatics in an upcoming issue.

BYE-BYE BURN-IN

In your "Build Your Own PC" article, you mentioned "burn in," then moved on to the next step and never mentioned it again. I want to know your opinion on how to properly "burn in" the machine, i.e., what software to use and whether it should be done before or after the OS is installed? Could you please shed some light on this point?

—JAMES SMITH

SENIOR EDITOR GORDON MAH UNG REPLIES: In the old days, a 24-hour burn-in after the OS was installed was critical in determining whether a PC included a bum part. Today, hardware and drivers have

improved to the point that you generally know within a few hours—if not the first few seconds—whether you have a bad component rattling around. Still, a burn-in will stress your key components (CPU, memory, videocard and hard drive), thus giving you peace of mind that your new creation is 100 percent ready for daily use.

Diagnostic programs such as SiSoft Sandra (www.sisoftware.demon.co.uk) feature burn-in tests that stress different system components. You can also use pro-level tools—such as those from companies such as Ultra-X (www.uxd.com). But most people simply prefer to run *3DMark2001*, *Prime95*, and even *SETI@home* after OS installation in order to stress-test their CPUs and video-cards. But if your machine posts without eliciting a burning smell, your parts are probably good for the long haul.

THE WINDS OF CHANGE

In your September 01 issue, you used a Pentium 4 processor in your Dream Machine gaming rig. I was wondering if you built that same system today, would you still use a Pentium 4, or go with an Athlon XP?

—ANTHONY EDWARDS

SENIOR EDITOR GORDON MAH UNG RESPONDS: In the ongoing war between Intel and AMD, you almost have to check the wind daily. There's no question that any Athlon XP has an advantage over the 1.8GHz Willamette Pentium 4 that we used in last year's gaming Dream Machine. (We must note that in that article, we also built a rig containing dual Athlon MPs, and a

P-III Tualatin box.) But if we were to build the ultimate gaming rig today, we'd probably go with the new Athlon XP 2100+ (that's 1.73GHz for those who don't buy into AMD's farcical naming conventions).

FOR THE RECORD

This is in response to a Reader Review of the Creative Labs Sound Blaster Audigy in the March, 2002 issue of *Maximum PC*: I have a few-thousand vinyls that I want to convert to CD format, but I've been waiting for a good soundcard. I looked, with great skepticism, at the Sound Blaster Audigy card a few months ago to see if it indeed records in 24-bit. At that time, I found that none of the Audigy soundcards is

level of credibility to suggest a system is better when no reasonably sane person should actually ever be encouraged to purchase one when they could buy two Totally Awesome Computers, have them delivered within days, and still have money left over for rent.

—SUPERDELL [OWNER AND PRESIDENT OF TAC]

EIC JON PHILLIPS REPLIES: We allow all OEMs to respond to our reviews in published letters-to-the-editor, thus Superdell's letter above. As for our March issue reviews of the Voodoo PC and TAC rigs, we stand by our final verdicts. We had many wonderful things to say about both PCs, but in the final analysis we found the Voodoo PC immi-

"Scott Safran, who has held the world record in Asteroids for 20 years... has finally been located."

capable of recording in 24-bit depth. They can *replay* in 24-bit, but recording is limited to 16-bit. I checked the Creative Labs site again today, and there was no change in the specs.

—KOICHI YASUTANI, AKA STEVE

SENIOR EDITOR GORDON MAH UNG RESPONDS: Indeed. The Creative Labs Audigy does not record 24-bit audio even though it does feature 24-bit analog-to-digital converters. Creative officials we've spoken to in the past say the limitation is in the software, and the company can't justify the expense of adding 24-bit audio support. Creative, we must note, has never said that the card would record in 24-bit, so it's unlikely the company will add the support in the near-term.

SUPERDELL: 'SURPRISED'

I'm a bit surprised that when reviewed of the Voodoo PC system and the Totally Awesome Computer [March 2002], you gave a higher rating to a system that has more finicky, higher-failure-rate hardware, less of a warranty, fairly comparable performance, and double the price. Wouldn't quality, performance, price, and warranty be more important than aesthetics to the vast majority of consumers? I think it a bit irresponsible for someone of your

nently more lustworthy, and that's why it received a higher score. We also believe that *Maximum PC* readers are quite smart enough to see the specific sets of values offered by both manufacturers.

TO SWAP OR NOT TO SWAP

The 10 score for Logitech's Z-560 4.1 speakers [March 2002] brings up a question. In your opinion, do they *outclass* the Klipsch 2.1s? I currently own the Klipsch 2.1 Promedia set, but could sell them and buy the Z-560s (in essence, an even trade as far as price). What is your expert opinion on this?

—PAUL LILLY

TECHNICAL EDITOR WILL SMITH REPLIES: Since they're two different types of speakers (4.1 vs. 2.1), it's difficult to directly compare them. The Klipsch 2.1s are still the best 2.1 set we've seen for the price. However, if you can dump off the 2.1 Klipsch speakers on one of your chump friends for the cost of a new set of Logitech Z-560s, we wouldn't say that that's a bad idea.

WHATEVER HAPPENED TO...

Scott Safran, who has held the world record in *Asteroids* for 20 years, couldn't be found for 15 years. However, he has finally been located. He died from falling off a roof while saving his pet cat in 1989. His family will be accepting a posthumous award

COMING NEXT MONTH

IN THE JUNE ISSUE OF MAXIMUM PC

► MP3s From Every Angle

The Napster kitty may have been declawed, but MP3s, portable audio devices, and file-sharing have never been more popular. We'll clue you in on the best software for finding obscure MP3s, review a slew of portable MP3 players and PC speakers, and compare digital audio formats in a colossal slugout. Plus: Tips on ripping and encoding the perfect MP3, and the last word on the "Squeal of Death."

► Motherboard Mania!

This is it! The *ultimate* motherboard buyer's guide. We'll have a full news report on the latest motherboard tech advancements, a complete guide to all of today's chipsets, and reviews of at least eight hot mobos. Intel, AMD, VIA, nVidia—no platform will be ignored!

► Secret Weapons of the 3dfx Brain Trust

It's December 2000, and the 3dfx rocket scientists are holed away in a secret bunker, deep in San Jose. ATI and nVidia are flanking from either side, so the brain trust prepares to evacuate before the venture capitalists roll in. They gather up all their R&D silicon, scurry over the perimeter wires, and scatter far and wide. In due time, they would all be working for their former enemies—but we have their secret hardware, the weapons of 3D war that never saw action. Witness the hardware that never was in the June issue of *Maximum PC*.

NOTE: This month, due to a scheduling snafu we were unable to run the "Battery Power Guide" that was announced in last month's Coming Next Month section. The battery power guide, however, will certainly appear in a future issue.

C&G Software

See It. Click It. Use It!



InstaFiles!

Project management made easy!

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- ◆ Switch instantly between multiple projects and windows
- ◆ Quickly view all open windows side-by-side in real-time thumbnails



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Microcenter, Fry's

from Twin Galaxies on his behalf. Could you post this news story? Thanks for helping me get the word out on Scott Safran.

—WALTER DAY, CHIEF SCOREKEEPER,
TWINGALAXIES.COM

EDITOR-IN-CHIEF JON PHILLIPS REPLIES: Done.

DON'T LIKE SPAM? THEN STOP BEING COMPLICIT!

Can someone please explain to me why PC users are so hypocritical? I have several e-mail accounts that receive several pieces of SPAM everyday. It got

"The dream of high speed, edge-to-edge burning may not be so far away."

to the point that it affected my physical well-being! I understand that legislators have tried creating laws against unsolicited e-mails, and that is all fine and dandy. However, these laws would not have to be put into place, nor would these hoity-toity PC users be up in arms, if SPAM didn't work. If nobody ever bought "cheaper printer ink" or "switched long distance carriers," these companies would deem the advertising ineffective and try something else. However, somebody out there is buying this crap, which means they will keep sending SPAM to my e-mail address. I scolded a co-worker for buying a scanner the other day from a pop-up add he got while signing onto AOL. When are people going to realize that we create our own misery?

—BRIAN T SMITH

THE TRUTH ABOUT TRUE X

This morning on my way to work, I began thinking about high-speed CD burners. New burners are coming out that claim speeds of up to 40x, but this is not an accurate figure, as they reach these speeds only at the outer edges of a disc. Now imagine a burner that could burn edge to edge, from the inner to the outer rings, at a constant high speed. This is not currently possible.

But a couple years back, Kenwood came out with a technology called True X. I won't insult or bore any of the editors with details of the technology, as most of us are already aware of how it works. Now imagine if True X technology was licensed to burner manufacturers like Plextor. With the current buffer-underrun protection in place, that would mean that a CD could be burned in approximately one minute or less! So far, I'm not aware of any CD burner

manufacturers that plan to take advantage of True X technology. Actual, edge-to-edge 40x CD burning—what a concept!

—NICK CARASIS

FEATURES EDITOR LOGAN DECKER RESPONDS: Einstein once said that, out of every 100 or so of his ideas, probably only one would really amount to anything. I bring this up because, while your idea is a good one, you might want to start working on the other 99.

True X technology, developed by Zen Research, made a big splash years ago with drives that boasted up to 72x read speeds. The

drive achieved these speeds not by spinning the disk faster, but by splitting the laser into seven discrete beams that read the CD at multiple locations simultaneously, thus resulting in higher read rates. *Way higher.*

Unfortunately, these drives required a lot of precision to read correctly, and after the initial love-fest when the drives were introduced, users began to find that True X drives were terrible at reading many CDs, especially CD-Rs and discs with copy-protection. The final nail in the coffin, however, was the spectacular disaster that was the Kenwood 40x. These drives had such a high failure rate that Kenwood was forced to replace scads of units, and as a result, the True X name was tarnished forever.

It's unlikely that True X technology would have been any more successful at burning CDs than it was at reading them. But the dream of high speed, edge-to-edge burning may not be so far away. Calimetrix and TDK are currently wandering around Europe showing off their ML drive: It uses an 8-bit grayscale burning system that triples capacity and speed on conventional CD-Rs (see "Beyond the X-Rating," September 2001 for more information on ML technology). The first ML drives should appear later this year, and we hear that burning speeds will begin at 36x, edge to edge.

USB 2.0 VS. FIREWIRE, ROUND 2

In the Fast Forward article by Tom Halfhill called "Will USB 2.0 Extinguish FireWire?" [April 2002], I believe he's missing a salient point. Intel is salivating at the thought of USB 2.0 because USB needs Intel drivers and chips to run, basically a small OS for the devices to talk to each other. On the other hand, FireWire was conceived as a true plug-and-play spec where no outside programs would be needed for the devices to talk to each other. Bottom line is that USB 2.0 will be a cash cow for Intel whereas FireWire stands

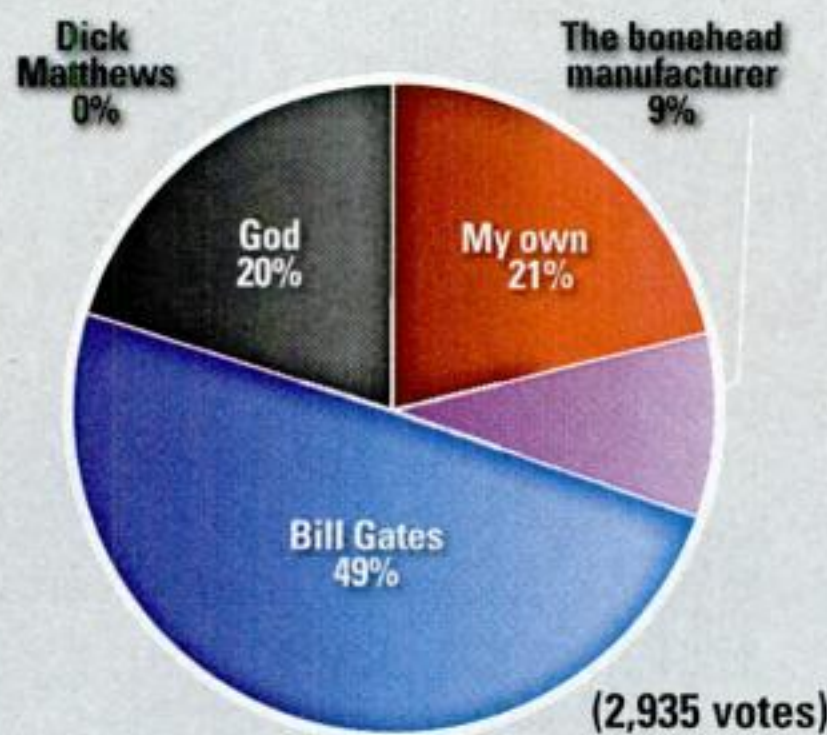
MAXIMUM PC's

READER PULSE POLLS

Your vote counts!

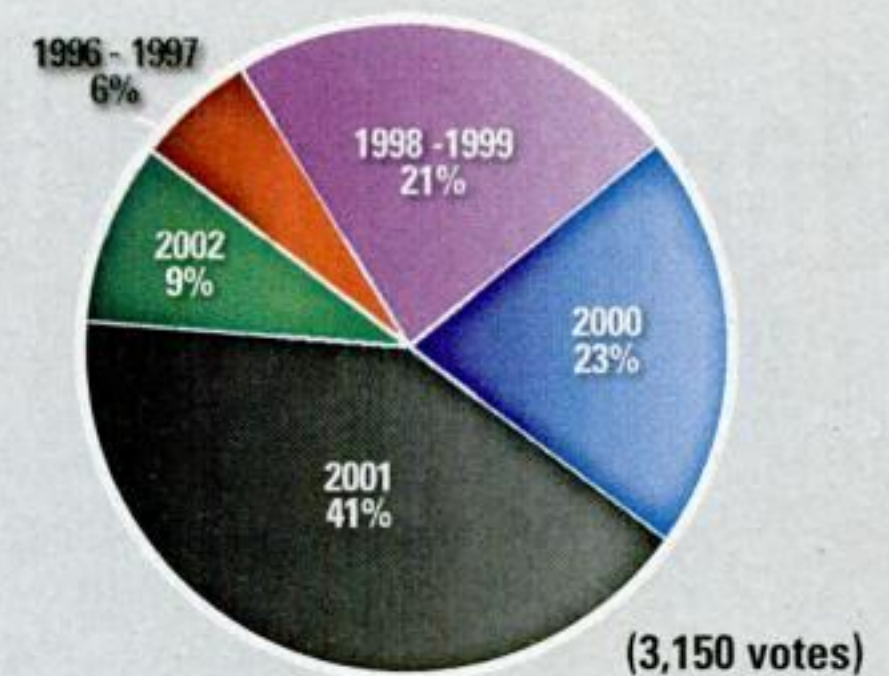
Please contribute to our reader polls at www.maximumpc.com.

When your computer crashes, whose fault is it?



We find it hard to believe that no one fingered Dick Matthews as the culprit in their PC misfortunes. In fact, we know that the Windows Tips guru is so often up to no good, we suspect him of tampering with this very poll!

When was your current 3D accelerator released?



Our readers sit on the upgrade-sooner side of the bell curve when it comes to videocards. A surprising majority of you upgraded your 3D accelerator in the last year; good for you! Equally surprising is the fact that 190 of you are still chugging along with 3D decelerators from the dawn of modern 3D. Time to ditch those Voodoo cards, boys and girls!

alone and doesn't make money for anyone.

It used to be said of USB components: "Simply plug in, the driver will be called up, and the device is installed without your intervention." Well, that isn't true anymore. Even a mouse sometimes requires you to install the driver first, reboot the computer, *then* plug the device in, and bingo, it's recognized. Not so with FireWire. Plug in a FireWire camera, hard drive, or backup system, and the icon pops up on the desktop. Nice and simple.

So while Mr. Halfhill and so many others, including myself, can't wait for a faster USB spec, I think everyone is forgetting the underlying reason why it's really being brought out, and that's money. Intel started the ball rolling by calling for all motherboards to be "inspected" by Intel before they were sent out, and now Intel wants the cash flow from companies needing its parts to build USB 2.0 components.

If I am wrong about this I'm sure you'll correct me, but these are my impressions from the white papers I've read.

—DORAN SKALAK

COLUMNIST TOM HALFHILL REPLIES: It isn't true that "USB needs Intel drivers and chips to run." USB drivers and chips are available from many sources. In fact, I used to work for a company (not Intel) that sold technology for creating USB chips. Anybody can license that technology. Excluding PCs, I estimate that the vast majority of USB products don't use Intel USB chips. Most PCs probably do have Intel USB-enabled chipsets, but PCs are only part of the vast USB market.

You are correct that FireWire has some advantages over USB. That's why it has been embraced by digital-video vendors, as I pointed out in my column. USB 2.0 eliminates one of FireWire's advantages (speed). The new USB On-the-Go specification addresses another USB shortcoming—the need for two USB devices to communicate through a PC or hub. I'll probably write about USB-OTG in the near future. As I said in my column, USB and FireWire can coexist in the marketplace.

DOES NO ONE LIKE DICK?

In your April issue, columnist Dick Matthews writes: "Also, every single person who wrote in explaining that you can get rid of the dog by clicking a UI checkbox is forbidden from reading my column for one year."

Uncle Dick never edits the Registry when a change can be made in the UI. Next time, before you write nasty

"Once again, Dick let his anger and emotions distort what could have been an effective communication effort."

letters about me, make sure you know what you're talking about."

Perhaps Uncle Dick should actually follow his own advice. I just got rid of the dog through the UI. Dog went away, dog stayed away. Open Search, go to Change Preferences, then go to the top of the list. Maybe it's a good thing Uncle Dick is switching to Linux.

—MICHAEL RIGGS

EDITOR IN CHIEF JON PHILLIPS REPLIES: Once again, Dick let his anger and emotions distort what could have been an effective communication effort. You see, his original March issue tip does much more than just "get rid of the dog"—it also reverts the WinXP search menu to its original Win2000 state. In other words, the tip gets rid of all the useless, newbie search options that appear in the WinXP UI. If Dick had any interest whatsoever in explaining himself clearly and concisely, he would have made the benefits of the Registry tweak clearer from the get-go—and he certainly would have explained himself fully in his follow-up explanation.

COLUMNIST DICK MATTHEWS REPLIES: Screw Phillips. ■



LETTERS POLICY: MAXIMUM PC invites your thoughts and comments. Send them to input@maximumpc.com. Please include your full name, town, and telephone number, and limit your letter to 300 words. Letters may be edited for space and clarity. Due to the vast amount of e-mail we receive, we cannot personally respond to each letter.

Quick Start

The beginning of the magazine, where articles are small

Mobo Memory Marches On

New DDR and RDRAM types are ready for take-off

Since DDR SDRAM splashed down in early 2001, the memory scene has been relatively quiet, with DDR and RDRAM coexisting rather peacefully. Later this year, however, the memory wars are expected to get super-hot. Here's an overview of the standards that are looking to supersede what you've already got plugged into your motherboard.

DDR333

DDR266—better known as PC2100—experienced a slow start, but has since emerged to become the standard high-performance memory for Athlon XP systems, and a low-cost/high-dividend proposition for Pentium 4 rigs. DDR333 is the natural evolution of DDR memory; its full “PC2700” specification should be made public by the semiconductor standards organization JEDEC by the time you read this, and the memory itself should become the defacto DDR standard by the end of the year.

Running at 166MHz double-pumped (for an effective clock frequency of 333MHz), DDR333 offers a theoretical bandwidth of 2.7GB/sec. VIA just released its KT333 chipset with DDR333 support, and nVidia has announced an updated nForce chipset with DDR333 support. Both chipsets will cohabitate with the Athlon XP.

Intel says its waiting to see how well DDR333 plays out before it adopts the faster DDR memory type for use with

the P4. As you might have already guessed, yield issues could affect adoption—some memory manufacturers are already reporting difficulties with fabricating the faster memory. In fact, most of the DDR333 modules currently on today's market are probably over-clocked DDR266 components, and some small-time vendors are already selling “PC3000” memory. This isn't a new spec, but rather over-clocked PC2700 memory that vendors have approved for use in over-clocked systems.

RDRAM

Rest assured, Rambus Inc. isn't just kicking back watching DDR grow and mature. For the last few months, the company has demonstrated what it thinks will be the next memory choice for the performance PC: PC1066.

Designed to work with CPUs operating on a 533MHz bus, PC1066 will increase bandwidth from PC800's 3.2GB/sec to 4.2GB/sec. The PC1066 modules will be sold under the name RIMM4200 and will, you guessed it, support 1066MHz memory speeds. Rambus is also introducing a slightly modified RIMM design that combines two separate 16-bit channels into a single 32-bit module, negating the need to run two 16-bit RIMMs in tandem. The modules look nearly the same as the current RIMM1600 modules, but are keyed slightly differently.

A follow-up to RIMM4200 is called RIMM9600. It will combine four 16-bit channels into a single module, run at 1200MHz and offer 9.6GB/sec of band-

width. Beyond that, Rambus has a signaling technology code-named Yellowstone that will support speeds of

Micron is prepared to ship real DDR333 modules.

3.2GHz and 6.4GHz, employing “octal” data rates on a 400MHz bus.

Despite benchmarks that show RDRAM to be clearly faster than DDR266 in Pentium 4 systems, RDRAM faces an uncertain long-term future in desktop PCs. Intel says it will continue to support RDRAM for performance desktop rigs, but is veering its workstation partners to DDR. To wit, Intel recently introduced a dual-channel DDR Xeon chipset in response to “customer demand.” Intel is also actively involved in the evolution of DDR and DDR-II, a notable development considering that last year the company's position was that DDR was a dead-end. Regardless, *Maximum PC* readers shouldn't sweat their next RDRAM motherboard purchase, because RDRAM will certainly be the performance memory choice for P4 boxes until 2004.

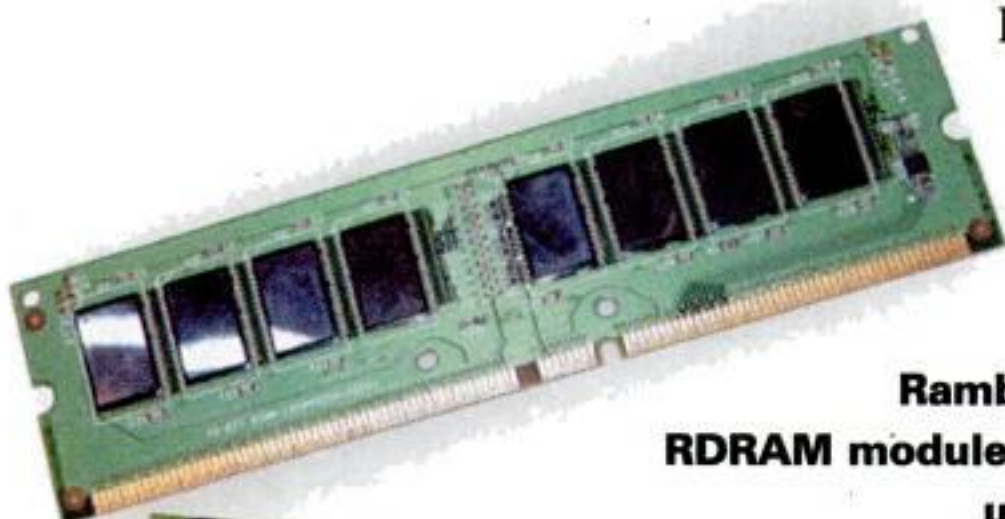
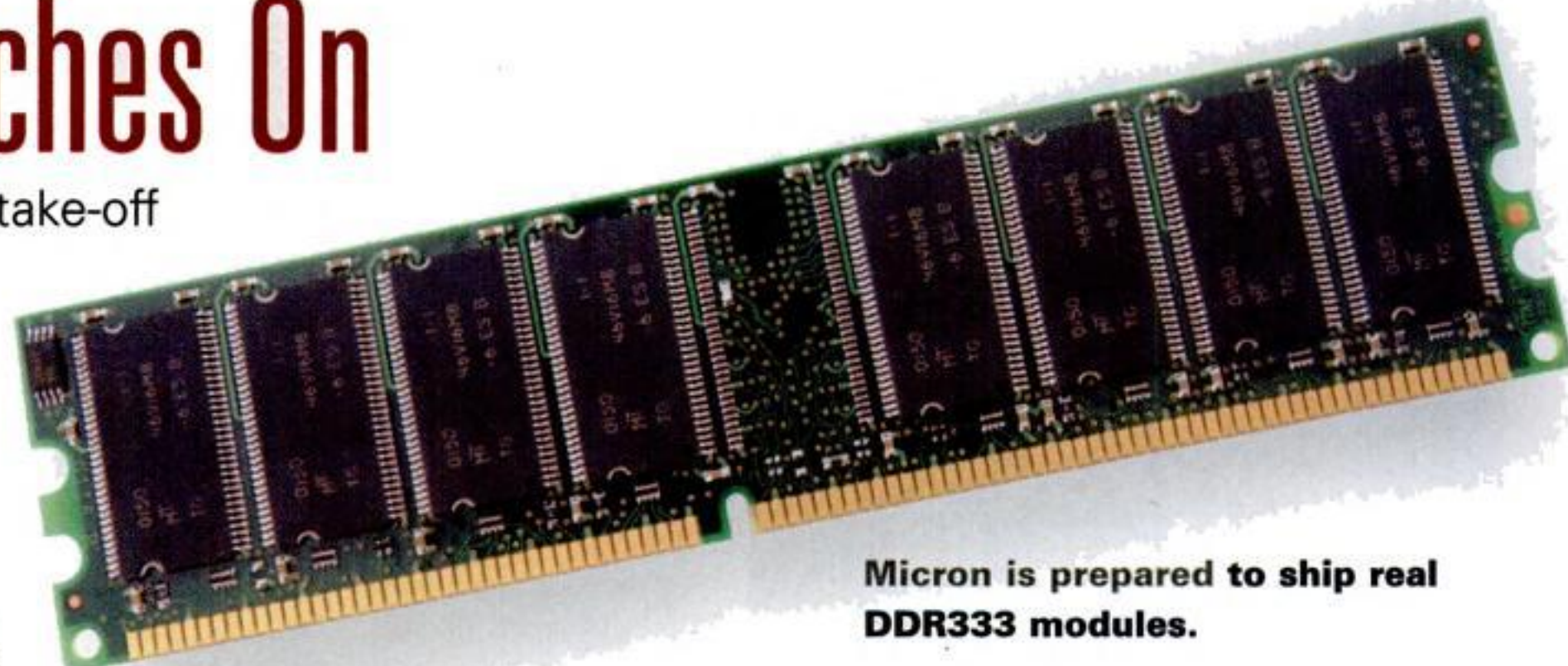
After that, Rambus executives may be the ones doing the sweating.

DDR: EPISODES II AND III

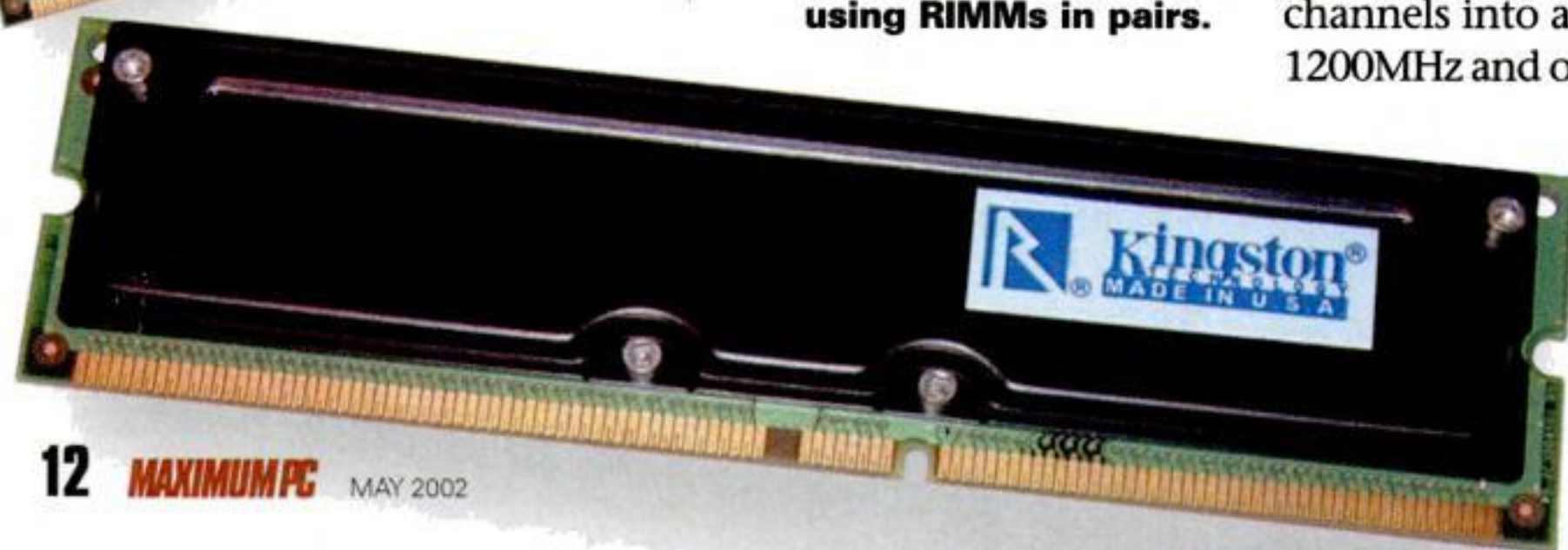
DDR333 might be just hitting the shelves, but memory makers are already pushing forward with an evolutionary change to current SDRAM technology. The first target is DDR400, which will use a 100MHz core speed (instead of 133MHz), but will be quad-pumped instead of double-pumped.

After that, the goal is DDR533 and DDR667, which will be quad-pumped at 133MHz and 166MHz, respectively. You won't be able to just pop these modules into your motherboard because the higher-speed DDR will run at 1.8 volts instead of the 2.5 volts that DDR266 uses. The new memory will require a new DIMM design as well.

After DDR667, a whole new technology should evolve. Target speeds are 800MHz and 1200MHz by the year 2006. For more info on all DDR specs, go to www.jedec.org.



Rambus is pushing a new RDRAM module that doesn't require using RIMMs in pairs.



OK, Now It's Really Hammer Time

Say hello to the 8151, AMD's no-excuses chipset

When AMD released the first Athlon CPU in 1999, the motherboard chipset that supported the launch wasn't exactly state of the art. In fact, it seemed more like a poor imitation of Intel's workman-like 440BX.

But with the launch of its new "Hammer" CPUs (see Tom Halfhill's March 2002 "Fast Forward" column), AMD won't

have to make any apologies. AMD's 8000-series chipsets will pack high-speed HyperTransport interconnects and support both AGP 8x and DDR333. AMD will also address several shortcomings of its current socket-mount design when the 64-bit-capable Hammers hit the scene later this year.

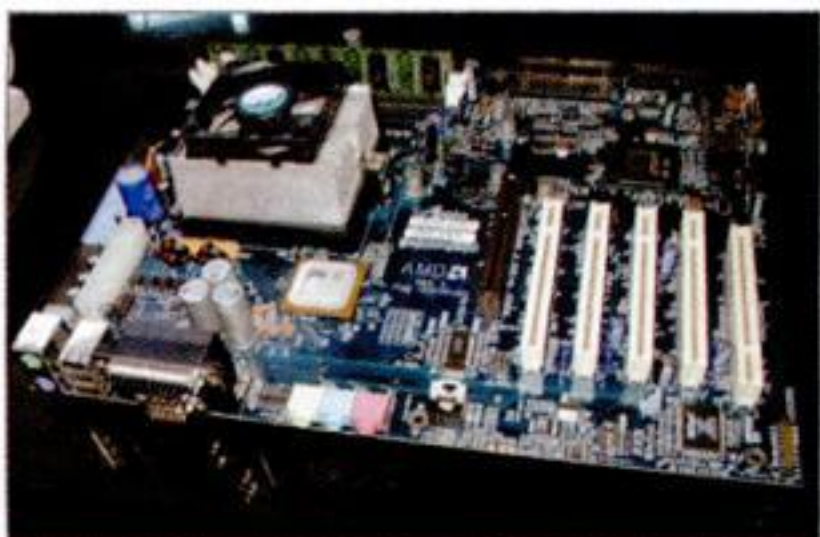
The 8000-series chipsets will ship in flavors for both multiproc servers and desktop boxes. AMD will pair its AMD-8151 chipset with its desktop CPU, code-named ClawHammer. AMD demonstrated working ClawHammers earlier this year, but has kept mum on details such as cache size and even frequency. AMD did, however, disclose that the pin-count of the ClawHammer would be 754.

Unlike other chipsets, the 8151 will mainly handle AGP chores and talk to the CPU and "southbridge" components. The memory controller will be moved into the actual CPU itself and support 64-bit DDR up to 333MHz. Communications between the CPU and chipset will move through a high-speed 6.4GB/sec HyperTransport conduit. Like nVidia's nForce, the 8151 will support HyperTransport communications to the I/O hub at 800MB/sec.

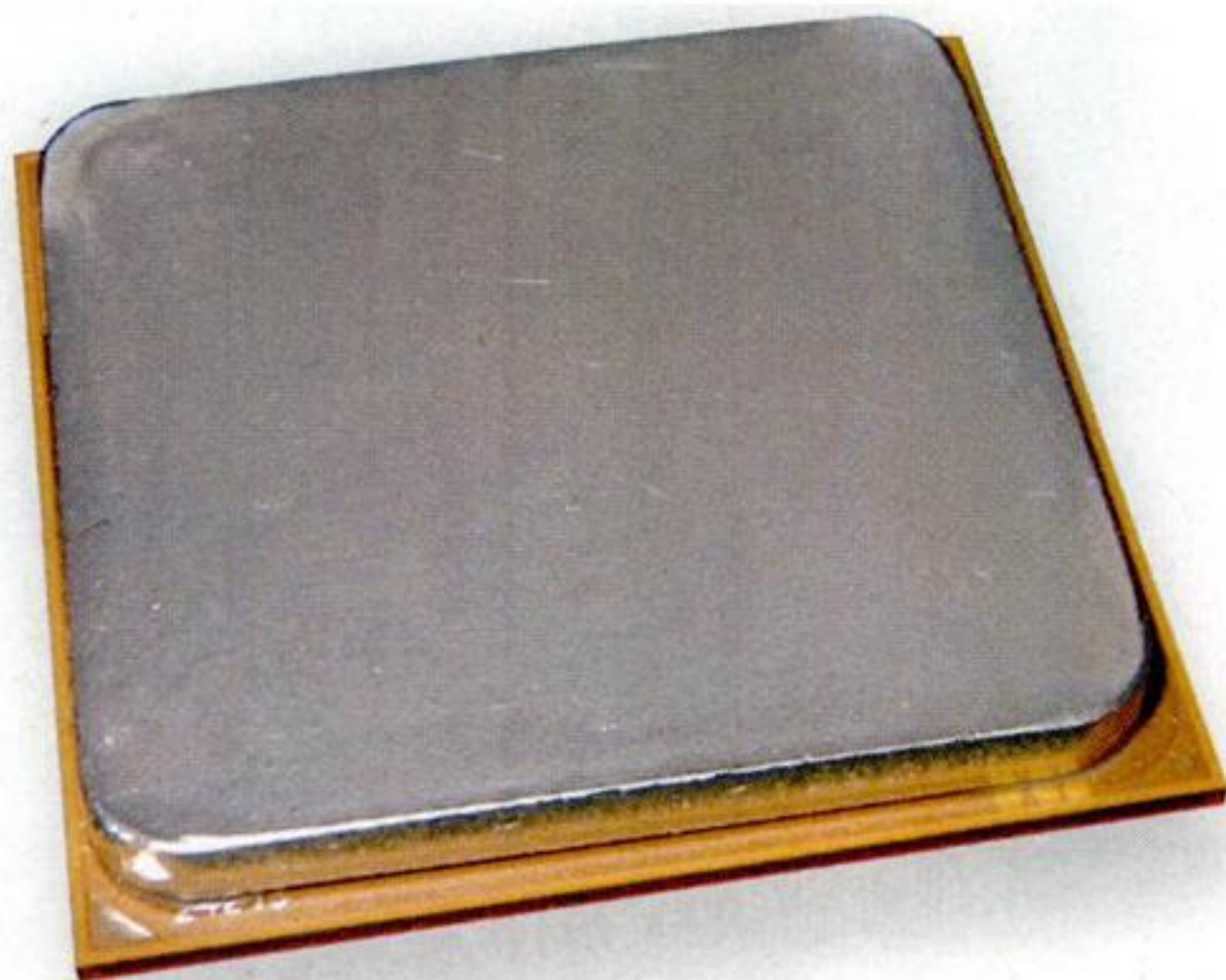
With the introduction of its new CPUs, AMD will take the opportunity to fix two shortcomings of its Thunderbird Athlon and Athlon XP CPUs. First, the ClawHammer will include an integrated heat spreader. Similar to the heat spreader that Intel introduced with the Pentium 4, the metal plate will help dissipate heat and protect the delicate CPU core from getting crushed. (Consumers have complained that current Athlon and Duron cores are too easily smashed when applying heatsinks.) Second, AMD will implement a new mounting and retention system that won't require you to nearly snap your motherboard in half in order to apply or remove a heatsink.

The ClawHammer CPU is scheduled for release near the end of this year, using a 0.13-micron process that employs silicon-on-insulator (SOI) technology. SOI will help push CPUs to faster speeds by increasing the switching speed of

the transistors. Before ClawHammer is released, AMD plans to introduce a 0.13-micron successor to the Athlon XP, code-named Thoroughbred, followed by a CPU code-named Barton that uses the 0.13-micron process and SOI. Barton and ClawHammer will likely compete with Intel's Northwood P4 replacement that's code-named Prescott. Prescott will enable HyperThreading and use a 0.09-micron process at multi-gigahertz speeds.



The reference AMD ClawHammer motherboard makes good use of HyperTransport.



The ClawHammer will feature 64-bit capability and sport a heat spreader.

FAST FORWARD

BY TOM R. HALFHILL



Intel's PC Vision: Home Mainframe

Intel revealed its vision of future PC evolution at its recent developer's forum in San Francisco. Not surprisingly, that vision places the home PC firmly at the center of a digital universe. Could it be the redux of the mainframe?

In the Mainframe Age, computers were big, expensive machines attended by operators in white lab coats. Users were lucky to share computer time on dumb terminals. PCs liberated computing from Big Brother, and computers even smaller than PCs are now embedded into everything from MP3 players and game consoles to digi-cams and digital TV recorders. Intel's vision seems to be that, in one way or another, everything digital is a PC peripheral.

That isn't necessarily a bad thing. Today's PCs are more powerful than the mainframes of old, and they've got CPU cycles to spare. Why not use them?

Intel is showing off its "Lecta" PC concept platform (the equivalent of a Detroit concept car—not a real product). Lecta relies heavily on wireless 802.11a/b networking to pull other digital gadgets into orbit. For instance, if you want to view your vacation photos, you don't gather friends and family around a tiny digi-cam LCD or your PC monitor. Instead, you seat the audience in the living room and let the PC transmit the photo files over a wireless LAN to your big-screen TV. (In the upscale households of the future, everybody has a wireless LAN and a networked big-screen TV.) Ditto for your digitized home movies.

Likewise, the PC wirelessly feeds MP3 files to your stereo system and any portable players within range. A fast PC can distribute multiple A/V streams, so Mom and Dad can watch a video of Maria's piano recital while Michael grooves to Green Day and Amelia dances to Destiny's Child.

One drawback of Intel's vision is that the PC shoulders the responsibilities of a mainframe. It must run 24/7 and be reliable. Intel is even talking about equipping PCs with watchdog timers—devices that automatically reboot critical embedded systems if they freeze up. (NASA can't make a service call on a Mars lander.) Also, the wireless LAN must be secure against eavesdroppers and radio hackers.

Even if you don't buy into Intel's PC-centric plan, the high reliability, availability, and security it requires are long-overdue features. Will my home PC become a wireless file server? I can take it or leave it. But a crash-resistant, dependable, secure PC? Yeah, I'll buy that.

Tom Halfhill was formerly a senior editor for Byte magazine and an analyst for Microprocessor Report. He is now a technical writer/analyst in Silicon Valley.

HELPFUL HINTS

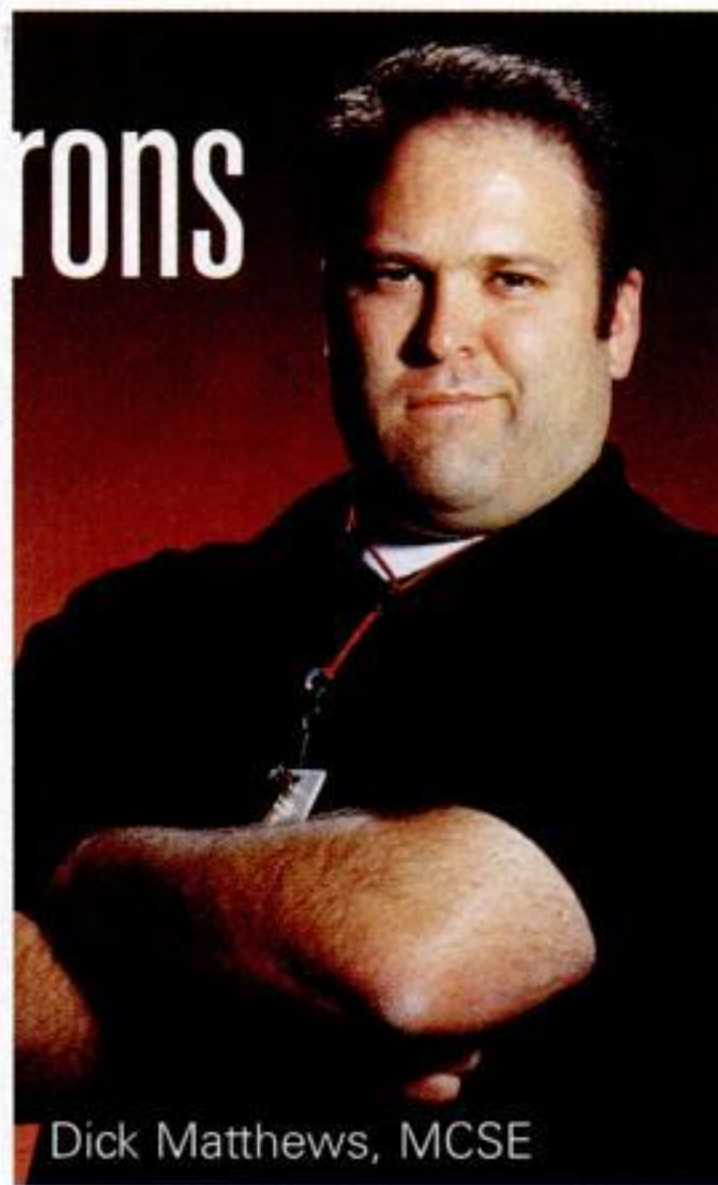
Windows Tips for Morons

Listen up, little girls. We're talkin' about e-mail

OK, you wise-ass l'users. I want to tell you a little story about e-mail attachments gone horribly awry. Last week, Midge in Accounts Receivable received an e-mail from her niece. The letter included a picture of a cute little kitten, along with instructions to forward the e-mail to everyone from here to Des Moines, or else bad things would happen to the cat. Boo-hoo. Naturally, Midge forwarded the e-mail to everyone in the office, then most of those mental rejects forwarded the letter yet *again*. The result: Uncle Dick got a 3 a.m. page telling him that his mail server was out of disk space. Dumbasses.

Which brings me to this month's tips on proper e-mail hygiene. With the double-threat of spam and viruses, it's easy for e-mail to change from a fun diversion to a hellish time sink. But it's actually pretty easy to prevent viruses and other spam from taking over your life. All you nitwits have to do is follow a few tips.

- Don't open attachments from strangers.
- Don't open attachments that you aren't expecting, even from your friends.
- Make sure you run antivirus software that updates itself daily. Antivirus software is worthless if you use only the definitions that came on the disk.
- Make sure to run a firewall. Dick likes ZoneAlarm (www.zonealarm.com).
- Don't spam your friends. An



Dick Matthews, MCSE

e-mail that implores you to "forward this to everyone in your address book" is almost certainly junk.

- Always check the box that says "Don't e-mail me anything" when you register for a site.
- Don't click the "opt-out of this spam message" link at the bottom of most spams. That just confirms to the spammer that they found a real, live e-mail address.
- Don't send attachments, especially ones larger than 200K, without warning the recipient first.
- Don't post your real e-mail address on any web site or online forum. Jon "Smelly Boy" Phillips gets 60 or 70 spam e-mails a day because his e-mail's on the *Maximum PC* web site.

And finally, everyone who thought that Uncle Dickie would forsake his MCSE to go over to the same team as those commie, penguin-loving, free-software nuts has another thing coming. Microsoft FOREVER!

Back to the Drawing Board

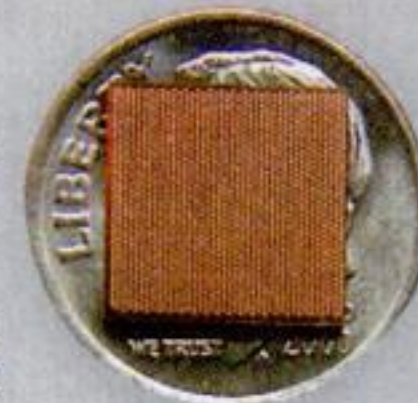
Want real pen computing? Wacom's new Cintiq 18sx is an 18.1-inch flat-panel display that lets you navigate and draw on the screen using the company's famous pen technology. The display/drawing surface rotates 360 degrees and detaches for use in your lap, while the accompanying pen features 512 levels of pressure and an electronic eraser on its tail-end. The Cintiq is color-corrected and has a surface that can withstand all the punishment a tough, burly graphic designer can dish out. But at \$3,500, only serious professionals need apply. For more info, go to www.wacom.com.



FUN-SIZE NEWS

Tiny Memories

Intel says it has made the world's smallest SRAM by using its next-generation 0.09-micron process technology. Cramming 330 million transistors in a 109 square millimeter chip, the SRAM can hold up to 52-megabits. The chip is smaller than a dime and demonstrates the density of transistors Intel will use to build its next-generation Pentium 4 chip, code-named Prescott. Prescott will use a 0.09-micron process and is expected to debut near the end of the year. Prescott will include HyperThreading and exceed 3GHz.



Let's Get Small

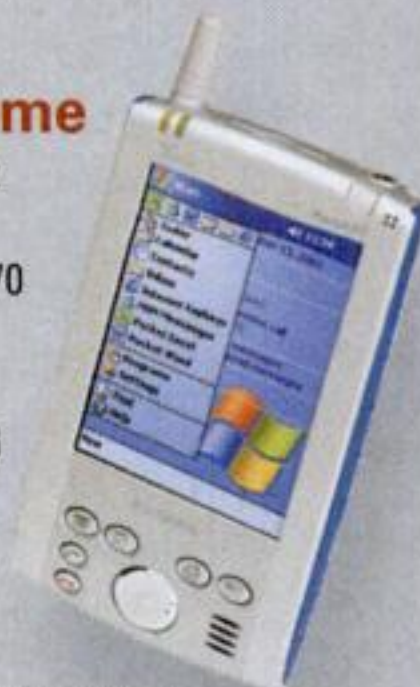
The era of decadent game packaging may be over. Electronic Arts, Activision, and a gaggle of smaller publishers have shifted to small boxes, signaling a sea change. Electronic Arts officials say the move just "makes good sense." The company has long been packaging games in small boxes for Walmart

stores, but beginning with *Medal of Honor*, EA moved all of its games to the more modest packages that are a little larger than a VHS tape. The smaller boxes use less cardboard and can be stacked on store shelves with the front facing out (instead of just the spine).



Pocket PC Phone Home

Audiovox has combined a Pocket PC 2002 PDA with a phone. Strikingly familiar to Toshiba's e570 Pocket PC, the Audiovox Thera adds a phone that's compatible with the new CDMA2000 1X or 3G networks. Thera supports data rates of up to 144Kbps, weighs about 7 ounces, and measures just 3x5x0.77-inches. The smart phone runs a Strong ARM CPU at 206MHz, has 32MB of SDRAM, and another 32MB of Flash ROM. Unlike Toshiba's e570, the Thera sheds the CF slot but keeps the SD slot. Verizon will sell the unit this spring at a price of \$1,000.



BAM: Bad-Ass Monitor

Not everyone can afford his or her own 9.2 megapixel monitor, but IBM says it has cut the price of its high-resolution T221 flat-panel in half to about \$8,400. The 22-inch flat panel supports a maximum resolution of 3840x2400 (that would be "QUXGA"). The monitor requires four DVI inputs to feed it enough pixels. The T221 has a 1-to-400 contrast ratio and has the ability to update its microcode through a USB port. At one point, the T221's predecessor, the T220, cost about \$50,000.



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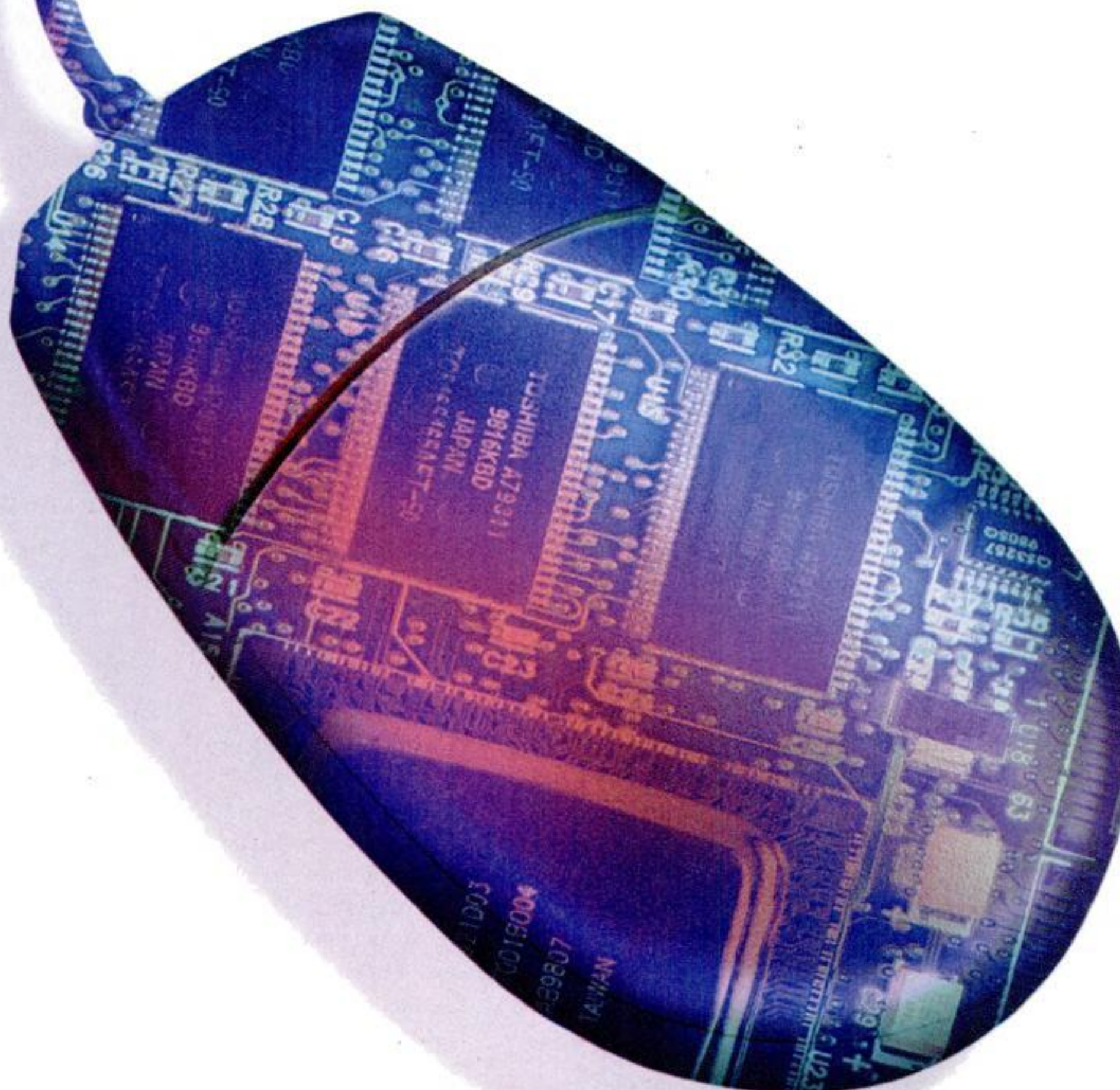
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What's Blizzard's Beef with Bnetd?

Have you heard of Bnetd? Blizzard sure has, and the company is mighty pissed. *Lawyer-level* pissed. That's never a good thing.

Bnetd is a Battle.net emulator. Back in 1998, a hacker named Mark Baysinger created some code to play *Starcraft* online without going through Blizzard's official servers. The reason was piercingly simple: Battle.net is a mess and always has been. It's crowded, slow, frequently down, and doesn't play nice with certain connection types. The emulator project was picked up by diverse hands and improved over the years, all for merely the love of games and the challenge of programming. No one benefited from Bnetd—aside from the gamers who could play *Starcraft*, *Warcraft II*, and *Diablo* multiplayer online without using Battle.net.

Blizzard and its parent company Vivendi didn't like this at all, and they ordered Bnetd.org shut down. It's actually pretty routine for a company to get twitchy when its products are adopted by end-users in unforeseen ways. The automatic reaction is to lawyer up and smack around the little guy until he toes the line, a technique guaranteed to fail while generating massive amounts of bad PR. Blizzard/Vivendi's concerns seem to focus on the fact that Bnetd doesn't perform anti-piracy CD-Key checks, which of course it never could do because only Blizzard has the CD-Keys, probably locked somewhere deep in its offices and protected by a low-res sprite. Blizzard says this encourages piracy because unregistered users can play illegal versions of the game online with impunity.

Maybe so, maybe not. I frankly don't care either way. If copies of Blizzard games are pirated and played on Bnetd, well, that's a shame. Piracy damages the industry, and Blizzard has every right to keep people from making illegal copies of its games. But that's Blizzard's problem, not mine, yours, or Bnetd's. If Bnetd appropriated proprietary code in order to function, or actively facilitated piracy by distributing the game or pieces of the game, I'd be on Blizzard's side. This isn't the case. The software just allows people to connect for Blizzard games, period. It does this through simple, legal, reverse engineering without modifying the software or circumventing copy protection.

It's not what Bnetd does that bothers Blizzard so much, but what Bnetd doesn't do: perform CD-Key checks. But Bnetd has no obligation to work as Blizzard's surrogate piracy police. The people who use it just want to play a game without being forced through a frequently-malfunctioning multiplayer service. If Blizzard really wants to get Bnetd, it could always do something really nutty, like fixing Battle.net.

Tom McDonald has been covering games for countless magazines and newspapers for 11 years. He lives in the New Jersey Pine Barrens.

Goodbye Add-in Cards?

Third-Generation expansion bus scheme may use cartridges

If you've ever cursed the motherless cuss who invented the PCI slot, your troubles may be over. Specifications are still being finalized, but it looks like 3GIO—the heir apparent to PCI—will assume one of two designs before it hits market in late 2003 at the earliest.



A cartridge system may replace PCI cards.

The first possibility is an evolutionary connector that's similar to the current PCI edge connector. But instead of using fixed-length slots, the 3GIO slots would vary in length depending on the bandwidth that's needed. A 1x 3GIO connector would be only about one inch long, but offer about four times the performance of a 32-bit PCI. A 16x connector, meanwhile, would be about the same size as a 32-bit PCI slot, but boast 64 times more bandwidth.

The second possibility is a truly revolutionary cartridge system. To replace a NIC, modem, or graphics card, all you would have to do is yank out the cartridge and slap in a new one. You wouldn't even have to open your case. Even better, 3GIO supports hot-swapping, so you could replace cartridges without having to power down your system. The cartridges would also offer better shielding, not to mention better protection, thanks to their shells.

Creative Labs Doubles Its Labs

The granddaddy of all consumer hardware companies recommits to the graphics market with the purchase of 3DLabs



Well, it's about time. ATI and nVidia will finally have a legitimate competitor in the consumer 3D graphic space for the first time since 3dfx bit the dust. The challenger is Creative Labs, and it's ready to rock and roll thanks to the purchase of 3DLabs, which has long built videocards for professional content developers.

Unlike Creative Labs' future 3D offering, 3DLab's Permedia 3 is a workstation chip, through and through.

Creative Labs says its goal is clear: to win over hardcore PC gamers and the high-end workstation market. The primary weapon of war will be a mysterious 3DLabs-designed chip that is said to produce 1 trillion operations per second. To compete with the big boys, Creative will buy 3DLabs for \$103.7 million in cash and stock (Creative previously owned 28 percent of 3DLabs).

Creative exited the bloody U.S. videocard business in 2000 to concentrate on audio products. Once a PC graphics powerhouse, Creative manufactured cards using graphics chips from nVidia, S3, 3DLabs, and 3dfx. 3DLabs currently sells cards to a large portion of the high-end workstation market, but long ago gave up on consumers.

Several financial analysts have pooh-poohed the 3DLabs purchase as a risky move for Creative. Creative officials, however, say the buy is similar to its purchase of E-Mu in the 1990s. Creative has successfully integrated E-Mu audio technology into its consumer products with the Live! and Audigy series of soundcards.

Stay tuned for more news on the Creative Labs 3D effort. The fight looks to be entertaining, if not entirely captivating.

You Won't See This in a Pop-Under Ad

Creative applications for the world's most notorious 'video cam'

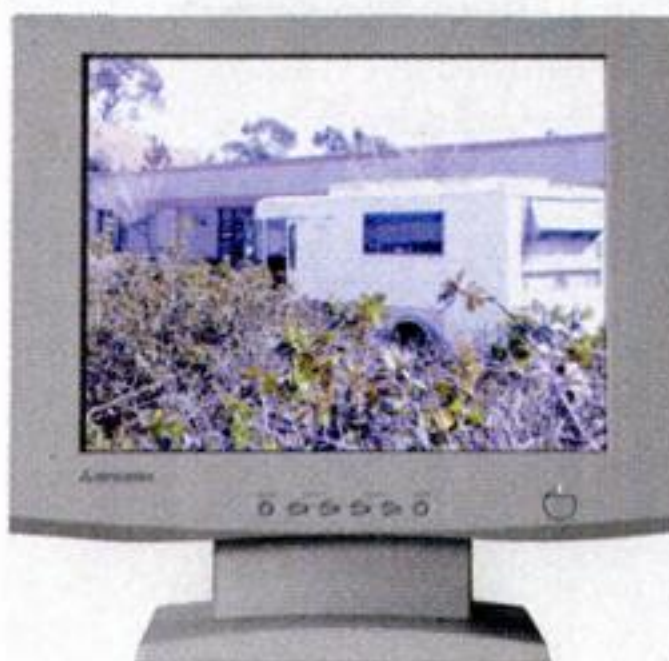
If you haven't encountered a pop-under ad for an X10 Wireless Video Camera, then you just haven't surfed the web. Seriously, these ads are everywhere, making the XCam2 the most overexposed product since Bud Light. Well, guess what? We finally succumbed. We called the X10 company and requested a video camera of our very own.

The web ad told us to "expect the unexpected," and that's exactly what we got when we positioned the cam in different locations around the Imagine Media complex. The XCam2 works as advertised, wirelessly transmitting clear images over some 200 feet of airspace to a PC or TV. We never saw anything quite as "unexpected" as a pretty woman dressed in evening wear, but we did capture some interesting sights...



Stalking the Wily Vede

Ah, a perfect specimen of *loafus vedermanus* in its natural habitat. You may better know this furry little feller as "The Vede," the hardware editor for *PC Gamer*, one of our sister magazines. The Vede usually frequents the Maximum PC Lab, doing his best to spirit away morsels of PC knowledge, but this time we caught him nesting in his hovel. We later checked his appointment book and found that he had penciled in 2 p.m. to 6 p.m. as "extended videocard testing—must not be disturbed."



Where's the Beef?

Every afternoon around 12:45pm, the *Maximum PC* editors start listening for the sweet strains of "La Cucaracha" that mark the arrival of Yummies on Wheels, the jitney food merchant that tempts us with exotic delicacies, such as corn dogs and tuna melts. After installing the XCam2, we can now spy Yummies' arrival before any other Imagine department hears its horn. Take that, Accounts Payable!



Sweet Hamster Lovin'

Even Old Man Phillips has a boss—his name is Old Man Firme, and he's the editorial director of our publishing company. We didn't want him to bust us death-matching when we should have been benchmarking, so we broke into Matt's office, and secreted the XCam2 on one of his shelves. Damn our eyes! We saw things that were much more shocking than even "Tina's Sorority Schoolgirl Cam"—for example, Matt's "special time" with his hamster dollies.



The XCam Cam

In an effort to create a 2001-esque effect that would let us see into the future, we pointed two cams at each other to see if we could discombobulate the space-time continuum. Unfortunately, all we got was a blurry picture of an XCam2. Hmm, maybe we'll have to wait for the advanced time-warping technology in the inevitable XCam3.



M-Baby Monitor

X10 says you can use the XCam2 to monitor your baby, but none of the *Maximum PC* staffers have children. So Jon decided to point the XCam2 at the next-closest thing—240 horsepower of gurgling Bavarian power. Jon now edits the magazine in full confidence that no parking-lot hooligans are molesting his treasured 5-year-old.



Snack Cam

The final destination for the XCam2 was the Imagine Media kitchen. Sometimes the benevolent God of Food will bestow the teeming Imagine Media masses with pizza, cake, deli sandwiches, and other delectables. But by the grace of an XCam2 hidden in the kitchen, *Maximum PC* editors get a vital 45-second lead over all other Imagine staffers. Here you see two employee-come-latelies from Circulation picking through our remains.

Thanks for the memories, XCam! We couldn't have eaten lunch without you!

Head2Head

A showdown among natural competitors

THIS MONTH: CRT vs. LCD technology

Whenever you see a PC on a networkTV show, it's inevitably teamed up with a flat-panel LCD display. Why? Because Hollywood set designers live in a bourgeois bubble, and they somehow believe that the rest of the world shares their own decadent, function-follows-form lifestyles. But PC power users know better: Flat-panel monitors have a lot to offer, but they still cost buckets of cash and aren't suitable for many computer applications. Are you a prime candidate for an

LCD? You'll definitely know after reading this showdown.

For illustrative purposes, we've featured Sony's finest CRT and flat-panel, but keep in mind that we're reviewing the universal merits of the competing technologies, not the specific Sony products. The 21-inch F520 CRT received a Perfect 10 verdict in September 2001; the 18.1-inch SDM-S81 LCD will be reviewed in an upcoming issue.

—JON PHILLIPS

CATHODE-RAY TUBES

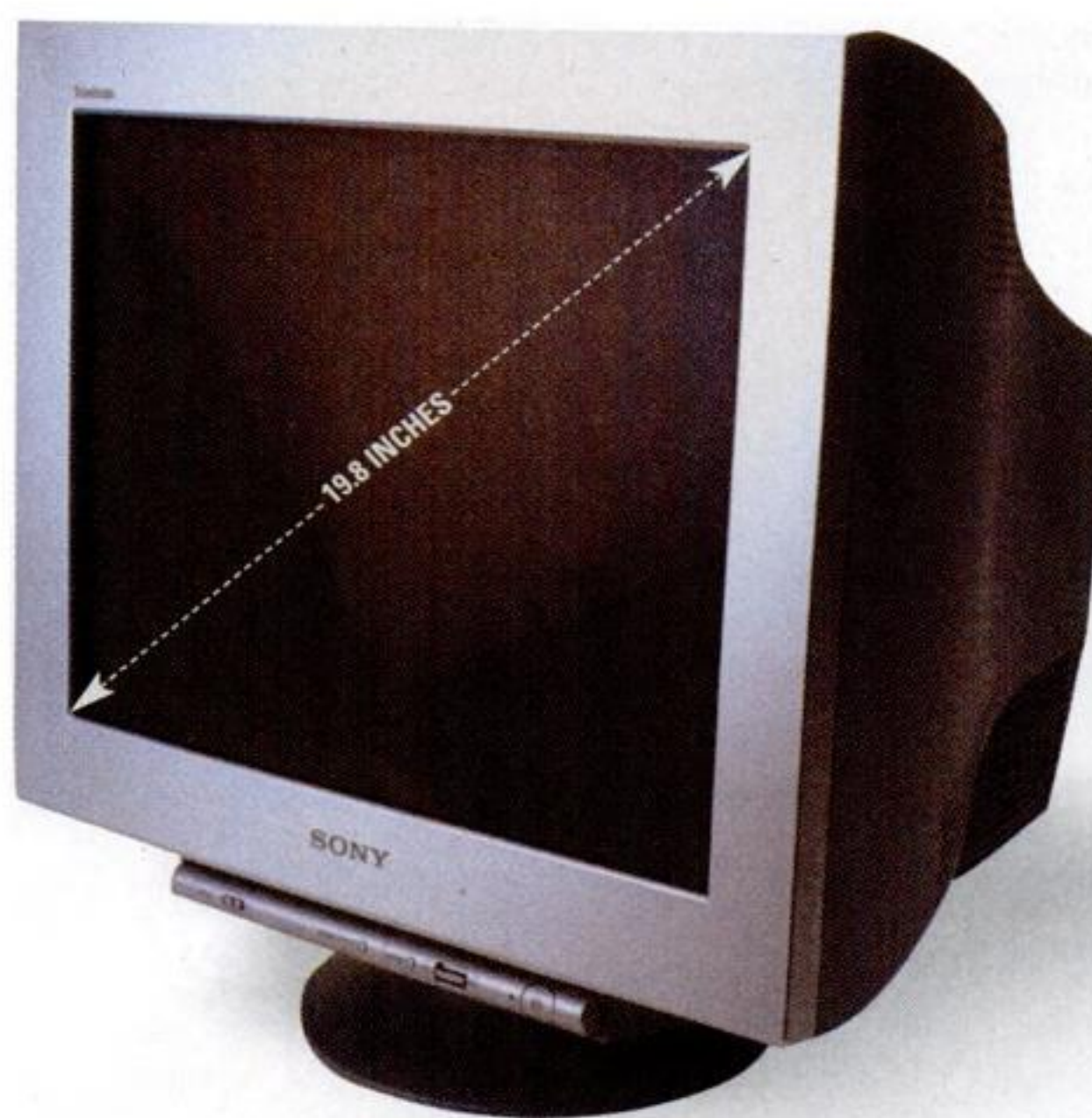
Resolution: CRTs can run a wide variety of resolutions at various refresh rates, so whether you're running a lowly 640x480 or an industry-standard 2048x1536, the monitor will spit back a non-interpolated picture, and thus consistent image quality. Plus, CRTs typically offer higher maximum resolutions than LCDs of comparable screen size—e.g., 1800x1440 for a 19-inch CRT vs. 1280x1024 for an 18-inch LCD—and resolution is king when it comes to media editing apps. We've never known a professional designer who didn't require the ability to switch resolutions at will.

Winner: CRT

Screen real-estate: All things being equal, CRTs don't make the best use of their real estate. To wit, a "21-inch" CRT will probably have a 19.8-inch diagonal viewable image area, because it can't scan the entire expanse of its screen (thus the black border that runs around the edges of all CRT screens). And, of course, CRTs are too unwieldy and heavy to be flipped 90 degrees so as to run in portrait mode. Still, if a wide, open, uninterrupted vista is what you're looking for, the 230 square inches of 24-inch CRTs like the Sony FW900 can't be beat. **Winner: Tie**

Speed: CRTs still dominate when it comes to keeping up with moving pictures. Whether they're displaying a DVD movie or a fast-paced 3D game, they can flip their pixels quickly enough to keep up with the action. This means you won't see the streaking or ghosting that occurs when playing games or movies on sub-par LCDs. **Winner: CRT**

Price per square inch: At a \$1,700 MSRP, the 21-inch Sony F520 is one of the world's most expensive desktop CRTs and offers some 180 square inches of real estate at about \$9.44 per square inch. But you can also spend just \$800 on the still-quite-beautiful 21-inch Sony CPD-G520, and pay just \$4.44 per square inch. All in all, CRTs give you more screen for your money than LCDs. **Winner: CRT**



Still-image quality: Mediocre CRTs can look rather dull compared to even mid-level LCDs—less bright, less brilliant. But they might actually be providing more accurate color, highlight, and shading accuracy. And the best aperture-grille CRTs certainly provide better high-detail definition. Still, for day-to-day image viewing, CRTs often look less impressive to lay eyes. This one's a toss-up. **Winner: Tie**

Flatness: Most CRTs are somewhat bulbous—they need to be in order for their electron beams to hit their phosphors at an acceptable deflection angle. The result is a concave piece of glass that imparts a touch of geometric distortion to the average human eye. Granted, more and more CRTs come with sublimely flat screens (the CRT pictured here is one of them), but as a whole, the CRT category is characterized by curvature. **Winner: LCD**

Physical size: No contest—CRTs are big, hulking, overweight fatties. At up to 70 lbs., they're difficult to move unless you're a competitive power-squatter, and they can consume three square city blocks of desk space. Furthermore, they demand a lot of power, and emit a lot of heat too. **Winner: LCD**

LIQUID CRYSTAL DISPLAYS

Resolution: Because its pixels are arranged in a fixed grid, an LCD essentially runs just a single resolution (its max resolution), and displays all lower resolutions as either a jaggy, blurry mess (the byproduct of interpolation) or in a small window framed by an extremely thick black border. This makes LCDs bad for playing 3D games, which need to be set at different resolutions according to the power of your videocard. Bottom line: Anyone who plans on using more than a single resolution shouldn't buy an LCD.

Winner: CRT

Screen real-estate: When you power up an LCD at its native resolution, you'll notice that the picture displays edge-to-edge—that's why a 15-inch flat-panel offers just about the same amount of screen real-estate as a 17-inch CRT. And many flat-panels also come with an option to run in portrait mode, which means you can flip the screen vertically in order to see text or spreadsheet lines without having to scroll. But while truly mongo-size LCDs are rare and extremely expensive, 21-inch CRTs are commonplace and truly affordable. **Winner: Tie**

Speed: Many LCDs are afflicted with low pixel-response times—their pixels simply can't change color quickly enough to keep pace with moving pictures. The result is streaking and blurring. For example, if you play video of a tennis match on a wonky LCD, the ball will appear to have a tail on it, just like Comet Kohotek! Pixel response times are quickly improving as LCD technology matures, but some LCDs still can't keep pace. **Winner: CRT**

Price per square inch: The 18.1-inch Sony SDM-S81 costs \$1,000 and offers about 161 square inches of screen real-estate at about \$6.21 per flat-panel inch. And the 18.1-inch NEC flat-panel we reviewed last month clocks in at just \$4.65 per square inch. But if you try to match the 180 square inches of a 21-inch CRT—in, say, one of NEC's 20-inch LCDs—you'll spend about \$2,000, or \$11 per square inch. Indeed, the largest LCDs levy a special price premium, and sources tell us that all LCD prices might actually creep up in 2002. **Winner: CRT**

Still-image quality: Flat-panel image quality has improved immensely in the last three years (thanks in large part to the almost complete elimination of video noise in LCDs that require analog-to-digital converters). Nonetheless, some panels still have trouble when reproducing highlights and shadows in high-detail images, and while their colors might be bright and brilliant, they may not be true. That said, people who just type and web surf often find LCDs to be more visually pleasing. **Winner: Tie**

Flatness: They ain't called "flat-panels" for nothing. In fact, LCDs are flatter than flat—they're, uh, flatterer. Whatever. The point being, these suckers are flat, and as a result, they impart no geometric distortion whatsoever. If you throw a grid pattern of perfect squares on an LCD screen, you'll see nothing but right angles from edge to edge. Yippee! **Winner: LCD**

Physical size: Even the largest 21-inch LCDs weigh less than 25 lbs. and consume very little desk space, which makes them ideal for frail, nit-picky grandma types. And because their power demands and heat emissions are so meager, large businesses will sometimes buy fleets of LCDs in order to save on energy costs. Indeed, a building's air-conditioning will kick in much sooner when it's trying to curb the heat emitted by 120 CRTs spewing in concert. **Winner: LCD**



THE UPSHOT

Without a doubt, LCDs win the cool-factor battle—they're sleek, high-tech, and are actually designed to look like industrial art. But they just don't offer the practicality, versatility, and image quality required by gamers, photo editors, professional designers, and all the other types who read *Maximum PC*. Buy a flat-panel for your eBay-surfing

mom, or get one for your office PC at corporate HQ. Hell, LCDs are even perfect as secondary displays in multi-monitor setups (see this month's HowTo on page 60). Just don't use one as your primary display. Instead, you should clear off your desk, put on your lifting belt, and hoist up that 21-inch CRT—it's the right thing to do. ■

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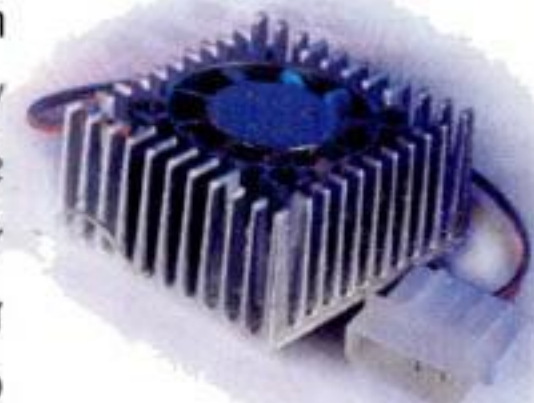
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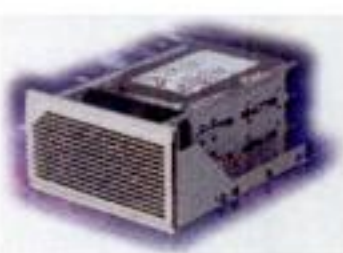
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WatchDog

Say hello to **Max**,
WatchDog of the Month.

Maximum PC takes a bite out of bad gear

THIS MONTH: The WatchDog goes after...

> **IBM**

> **Counterfeiters**

> **RealNetworks**

Counterfeit Compaq, Etc.

If you bought Compaq-branded memory or a hard drive for pennies on the dollar, don't be so sure you got such a great deal. In February, U.S. Marshals and Compaq raided an East Coast computer store and seized large quantities of counterfeit parts. According to Compaq, Hardware 4 Less of Bow, New Hampshire was supplying counterfeit memory parts to other wholesalers filling customer orders. U.S. Marshals seized counterfeit hard drives, memory, labels, packing materials, warranty booklets, and software licenses. Hardware 4 Less's web site was offline at press time, and The Dog could not reach company officials for comment. Compaq officials say it had no relationship with Hardware 4 Less, and that Hardware 4 Less was not selling gray-market equipment. Gray-market equipment is authentic hardware intended for an overseas market. Counterfeit hardware is often low-grade or even faulty equipment remarked with a brand name. Of course, counterfeit hardware isn't covered by the manufacturer's warranty.

This is the second such incident for Compaq. Last year, the company went after California computer store Dynasty Memory, Inc. for allegedly selling counterfeit parts. The raid by U.S. Marshals netted several million dollars in counterfeit components. The best way to avoid counterfeit parts is to be aware of what you're buying. Compaq has set up two web sites to help you differentiate between authentic and counterfeit parts: www.compaq.com/newsroom/advisory/memory.html and www.compaq.com/newsroom/advisory/harddrives.html.

A good rule of thumb if you don't want to get fleeced is to be wary of deals that seem too good to be true.

.....

In March, The Dog left a boo-boo on the carpet by saying that Antec cases are manufactured by Chieftec. In fact, Chen-Ming manufactures cases for both Antec and Chieftec.

A Real Pain

DEAR DOG: What is up with the folks at Real now? The latest version of *RealPlayer*—*RealOne Player*—always launches the message center! Every time

it opens, it adds a line to the Registry so that it's always launched at startup, and I can't find a setting to disable it!

It's a real pain having to manually remove the Registry entry each time! Can you help me get to the bottom of this, or is it time to just stop using Real?

—AMY

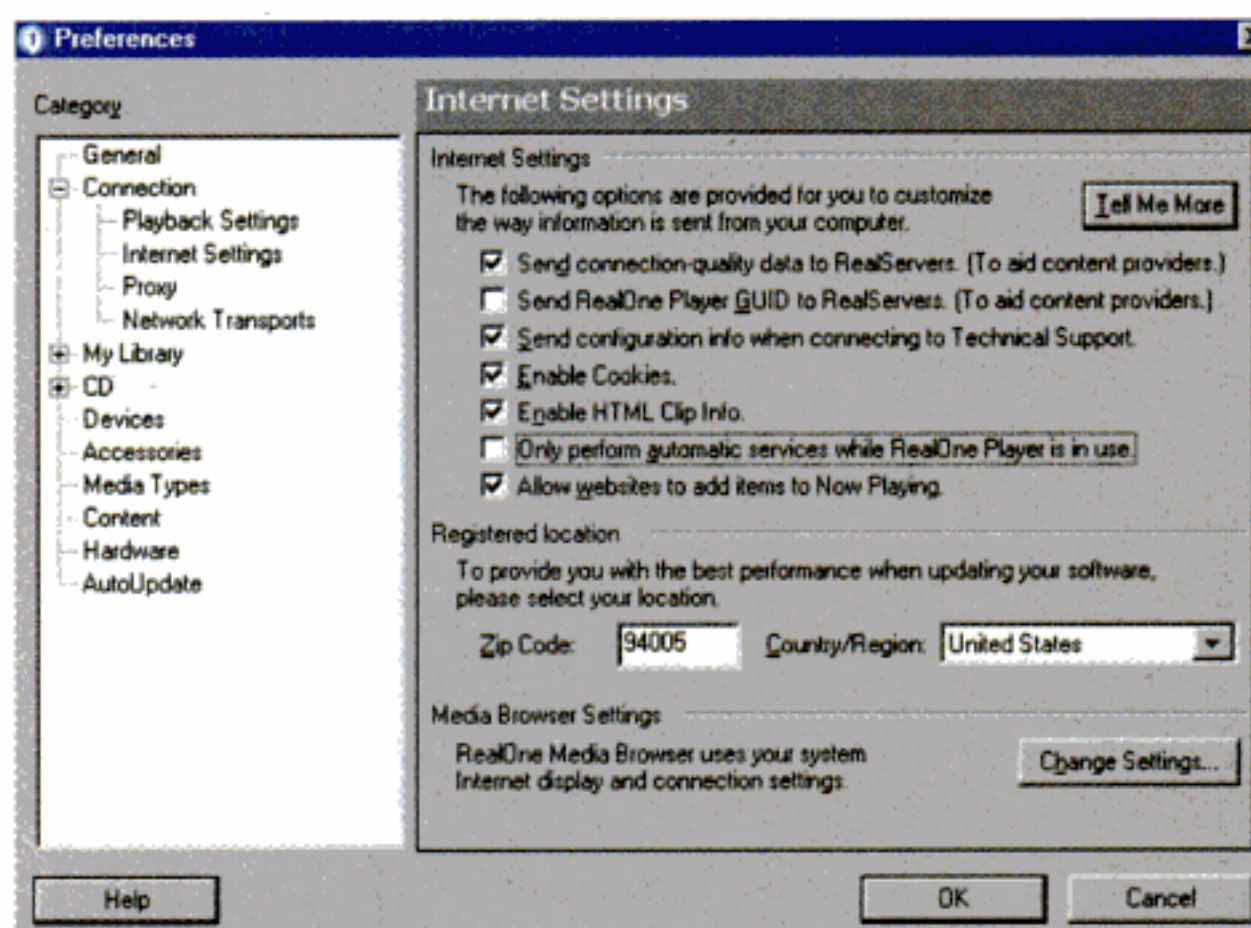
THE DOG RESPONDS: The Dog contacted Justin Hutchinson, product manager for *RealOne Player*, about the problem. Hutchinson says the inability to turn off the message center could stem from the version Amy is running. The beta version of *RealOne Player* didn't let you easily turn off the message center. Hutchinson says that negative feedback regarding the message center caused Real to change the final version of *RealOne Player* so that a user can turn off the center or greatly reduce the frequency at which it pops up. Unfortunately, in The Dog's opinion, the checkbox to disable the message center and other automatic facets of *RealOne Player* is less than obvious.

To prevent the message center from popping up when you're not using the player, you must go to Preferences, then Connection, then Internet Connections, and uncheck "Only perform automatic services while RealOne Player is in use."

Hutchinson acknowledges that some people may have problems understanding what the checkbox actually turns off, and says Real is working to clarify the information for users. The Dog suspects that, in reality, the phrase was crafted to intentionally keep users from turning off the auto update. Woof.

Power-On Dude!

DEAR DOG: I recently purchased an IBM 120GXP 60GB hard drive for a new computer I'm building. Based on reviews I've seen and the new specs, I was looking forward to its better performance over the 75GXP and 60GXP series. However, I ran across a story on Storagereview.com that said the drive is not recommended for use in servers. Apparently IBM is including a



Confusing language in the *RealOne Player* may stop people from turning off the message center pop-up.

statement in the 120GXP's warranty that says the drive should not be used more than 333 hours per month!

This makes me nervous. I don't want to have to worry about keeping my computer on overnight or for

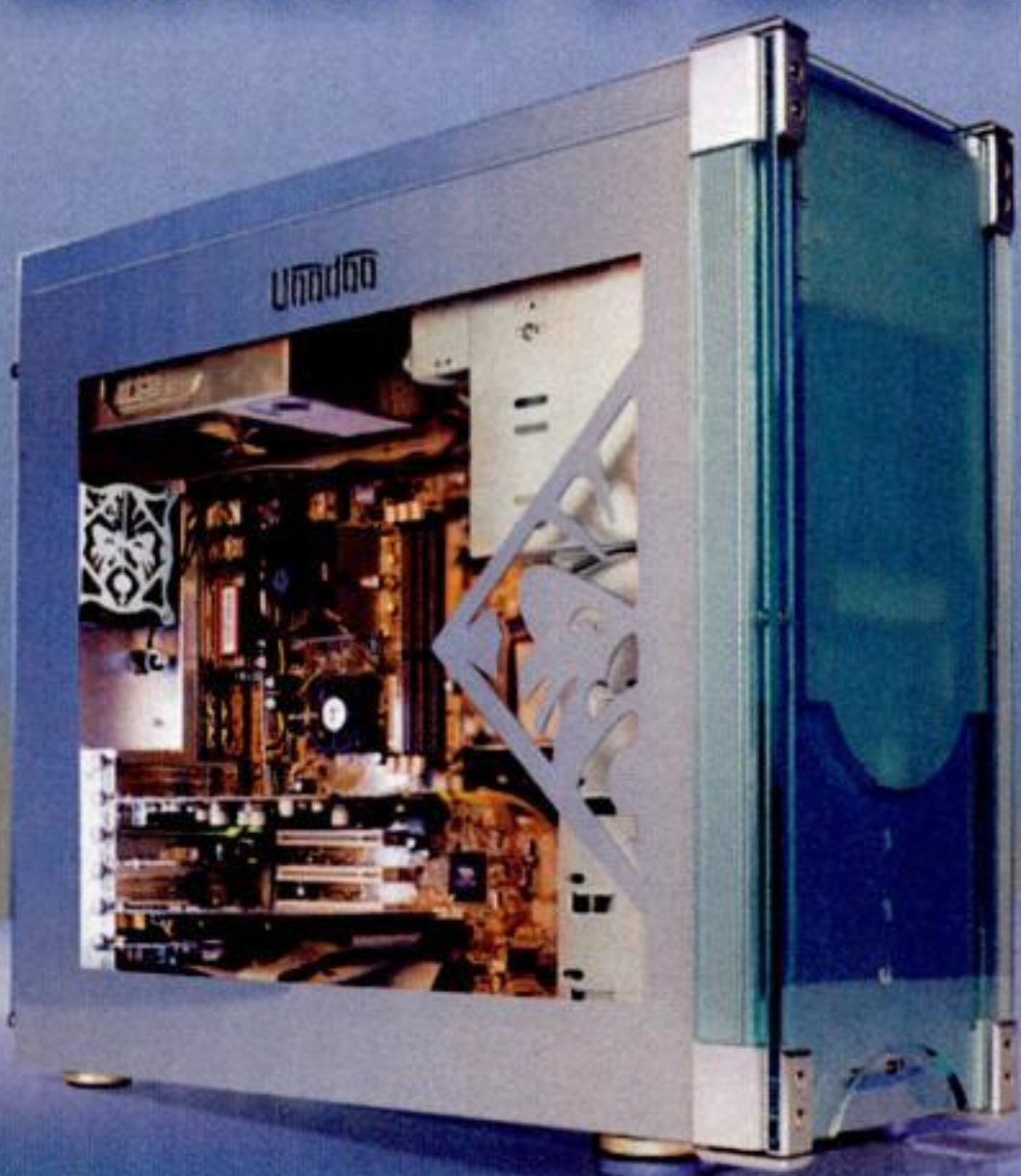
"The raid by U.S. Marshals netted several million dollars in counterfeit components."

extended periods of time. There are a lot of unanswered questions: If I use APM to shut off the drive when not in use, does this count? Would this be considered a "normal" warranty, but other vendors just don't include it? Or is there something wrong with their technology, à la the 75GXP?

Any info The Dog can find out about this would be great! If this is a big problem, I want other *Maximum PC*

Got a bone to pick with a vendor? Been spiked by a fly-by-night operation? Sic The Dog on them by writing watchdog@maximumpc.com. The Dog promises to get to as many letters as possible, but only has four paws to work with.

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readers to be aware of it.

— TODD THOMAS

THE DOG RESPONDS: Todd is one of many consumers concerned about IBM's published "power-on hours" spec. After the issue of the "spec" was raised at StorageReview.com, word quickly spread on the Internet that the 120GXP should not be left on for more than 11 hours a day, or 333 hours a month. Indeed, IBM's own documentation seems to back this up. The spec sheet for the 120GXP clearly says under the Reliability header that the "Recommended power-on hours (monthly)" is 333. On the surface, this would seem like a damning figure, as few would ever buy a hard drive that can't be run for more than 11 hours a day. When

the drive be used within the specification, but using the drive 24/7 does not mean it will fail any sooner," an IBM spokeswoman said. She added that concerns over the warranty of the drive are also misplaced. Running the 120GXP for 333 hours a month or running it continuously until NBC finally cancels "Friends" in the year 2005 will have no impact on the warranty.

Is IBM speaking the truth? Apparently so. The Dog interviewed two other hard drive manufacturers about the 333 power-on figure and discovered that a similar figure is also used by them when determining the lifespan of a hard drive, even though they test and design the drives to be run continuously. Both of those hard drive makers also said they don't believe IBM intended to suggest that you can't run the hard drive 24/7. In the end,

"For optimal service life, we advise that the drive be used within the specification, but using the drive 24/7 does not mean it will fail any sooner."

contacted for information, IBM officials said the concern is blown out of proportion. The power-on specification is just a guideline that all hard drive manufacturers use to estimate hard drive life, and it does not mean the drive cannot be run 24/7. IBM officials did caution, however, that like any device, be it a phone or car, running it continuously may shorten its life.

"While the 120GXP was not specifically designed for 24/7 operation, it has been used successfully in that environment. For optimal service life, we advise that

IBM's decision to disclose the power-on hours looks to be a tempest in a teapot. (The company uses the same figure for its 60GXP and few consumers have complained.) The Dog believes the real story is that IBM is exercising extreme caution since it's become embroiled in a lawsuit over the reliability record of its popular 75GXP hard drive (visit www.sheller.com/ibmclassaction for details about the 75GXP lawsuit). The short story is that 120GXP owners shouldn't worry about how long they leave their drives on. ■

RECALL ALERT

HP printer cords are shockers

Hewlett-Packard is recalling some 2.5 million power cords sold with some of its printers, because the cords may crack and pose a shock hazard.

The cords were made by Longwell and sold with the Hewlett-Packard Deskjet 800 and 900 printers as well as the HP Photosmart 1000, 1100, 1200, and 1300 series printers. The defective cords were sold with printers in the U.S. and Canada beginning in April 2001.

The cords specifically say LS-7C and have U.S.-style two-prong plugs. Hewlett-Packard says its engineers discovered the flaws during routine inspections at its return center and that no consumers have reported experiencing similar problems. The voluntary recall is being conducted with the cooperation of the U.S. Consumer Products



Power cables sold with printers like this HP photo printer may crack and expose you to electrical shocks.

Only Longwell
LS-7C cables
issued with
certain HP
printers
are at
risk.



Safety Commission and Longwell. The company will pay the postage for customers to ship the defective cables back to Hewlett-Packard and will provide customers with free replacement cables. The company says there is no risk of the cables damaging the printer or its attendant equipment.

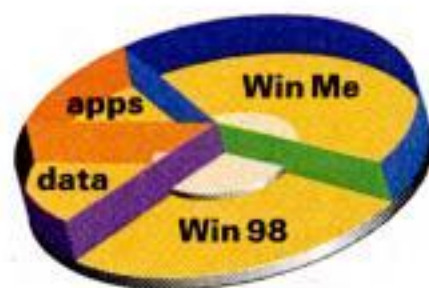
To order a replacement cord, contact HP at 877.917.4378 or visit www.hp.com for more information.

Sometimes the key to getting along is keeping things **separate**—including the data on your **hard drive**.



PartitionMagic lets you maximize your hard drive space, run multiple operating systems, and organize & protect your data.

PartitionMagic®—The old saying goes, “fences make good neighbors”. At PowerQuest we know this holds true with more than just people. Your hard drive is full of valuable information...okay, maybe some is not so valuable, nonetheless it needs to be protected and organized. That's why we created PartitionMagic.

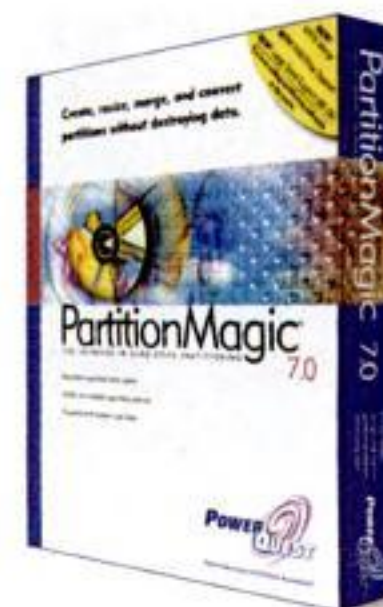


PartitionMagic allows you to safely and easily create partitions on your hard drive without destroying data. It's like creating fenced areas for your business data, the kids' games, even information you download can have its own area. Sound complicated? Not really. We provide a step-by-step wizard interface that walks you through the entire partitioning process, allowing you to easily create, resize, redistribute, merge or copy partitions. And if you're not sure you like where the fence went up, PartitionMagic lets you preview and modify your changes before you make them.

Other features include:

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- *Undelete partitions*
- *NTFS merge*
- *Large drive support (80GB)*

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TAKING AIM

at your
PC's worst
bottlenecks

A comprehensive guide to purging your
PC of every chokepoint

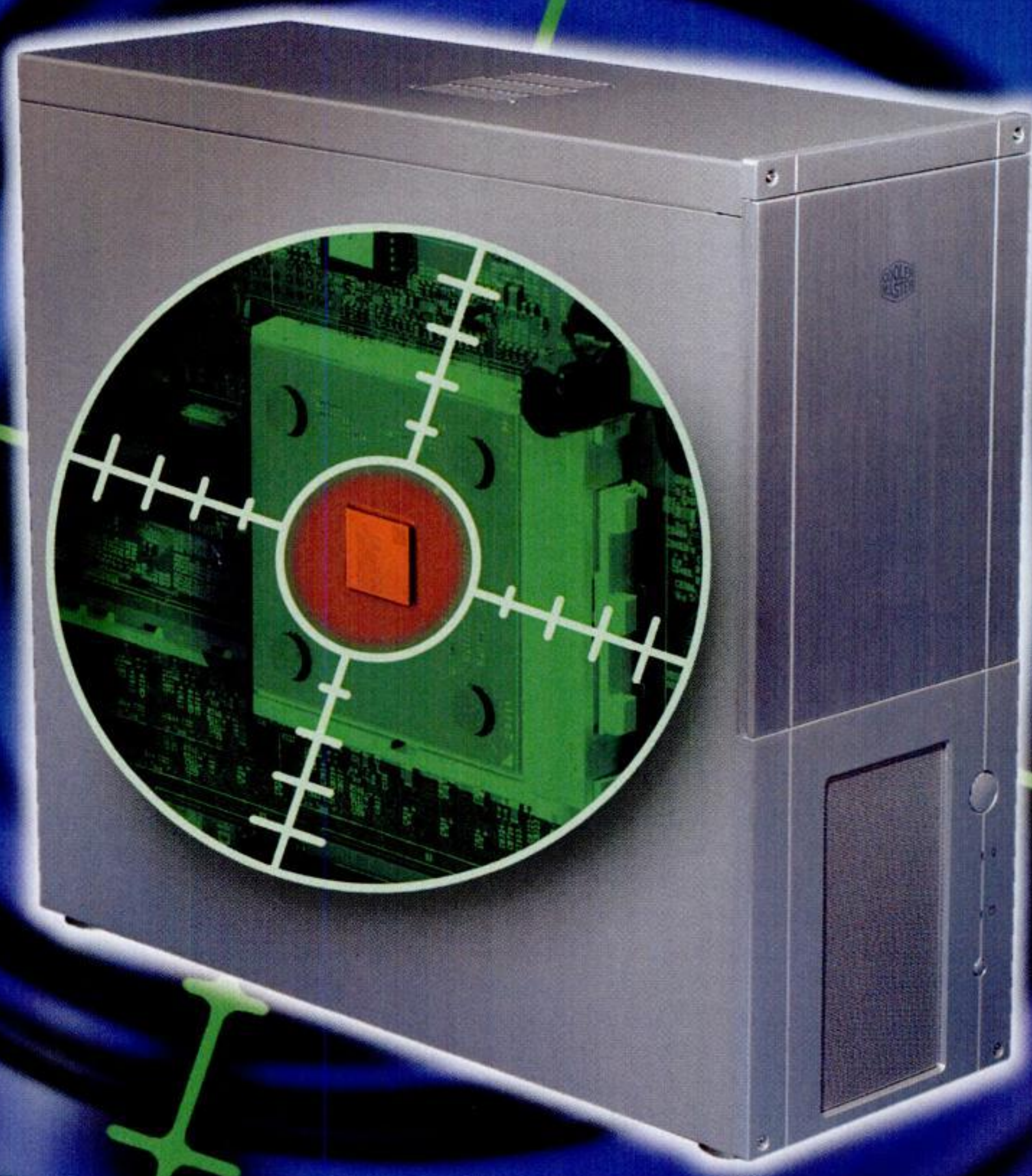
The inside of your PC may be abuzz with activity, but somewhere therein certainly lurks a laggard. Your CPU, for example, may be idling away precious processing cycles as it waits for your hard drive to catch up. Your videocard, meanwhile, may be twiddling its thumbs, doing a whole lot of nothing as it waits for your CPU to finish its floating-point calculations. And *every* subsystem in your PC may be growing old and lonely as it waits for your barely ambulatory 56k modem to shuffle data downstream.

Sure, your computer is "fast." But even if every single component in your PC is state of the art, one subsystem is still slower than all the others. It's called a bottleneck, it's slowing down your games and applications, and it must be eliminated.

So please join us on our search-and-destroy mission. We'll tour the insides of your PC and appraise each component for its speed, technology, and bottlenecking potential. We'll examine how serious each potential bottleneck can be, and tell you what you can do about it. Some bottlenecks require just a small tweak. Others require a complete subsystem upgrade. But all need to be addressed. Today.

By the Maximum PC staff

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HARD DRIVES

Say hello to your PC's worst bottleneck

Ever seen your PC's disk-access light blink like mad, but little useful work seems to materialize? The machine is likely spending a lot of time waiting on data from your hard drive, a hoary geezer with a heritage dating to the 1960s. While CPU clock rates—not to mention the number of instructions executed per clock cycle—have advanced more than 400 times since the days of the original IBM PC, disk access times have improved by just 10 or 20 times since then. So at some point, even the pokiest CPU is going to end up waiting around for data from your hard drive.

This scandal is a result of the massive storage requirements of today's PCs. The only cost-effective and reliable way to provide multi-gigabyte storage is through magnetic hard disk drives, a mechanical technology that has changed little since the infant days of computers. Here's how it all works: The read/write heads of the drive fly just microns above aluminum platters, which are coated with magnetic emulsion and spin at high speed. These heads scan the surface of the platter until they arrive at the correct location, then wait until the right data block spins beneath the head (the time it takes for the latter to occur is known as "rotational latency").

Modern consumer drives make a valiant attempt to alleviate the bottlenecks intrinsic to

this scheme by employing internal caches that range from 512KB to 8MB. The caches allow the drive to read a few sectors ahead in anticipation of the next read request. Higher rotation speeds (7200rpm for IDE, and up to 15,000rpm for SCSI) as well as higher recording densities have also improved access times, transfer rates, and capacities. But the whole hard drive enchilada is still dependent on physical movement.

Drive sluggishness can be particularly painful while playing games loaded with textures and multimedia files (in other words, 99 percent of all games you've ever played). Hard drives perform best when presented with a series of sequential I/Os. But most games push hard drives brutally, reading large files (like cutscenes) sequentially and multitudes of smaller files (such as textures and audio clips) randomly, depending on the game's design. Your hard drive struggles with these random I/Os. Getting the read/write heads positioned over the right cylinder, plus waiting for the platter to spin into place, consumes over 98 percent of a random I/O access time. In fact, transfer time is just a small fraction of the total time. The more data you can transfer per I/O, the better your disk can perform.

Until something wacky like holographic storage arrives, the best we can do is to work around the hard drive's limitations. When you shop for a new hard drive, insist on a minimum 7200rpm drive with access times of 9 milliseconds or less. The drive should have a cache of at least 2MB, but more is better. Make sure you get an ATA/100-capable drive, and look for the highest sustained transfer rate available.

Use a drive cable specifically made for ATA/100; if you don't, you will not get ATA/100 performance. (An ATA/100 controller looks for a specific signal that only an ATA/100 cable provides.) If your motherboard does not support ATA/100 and you've got at least one ATA/100 drive, consider an add-in controller to boost your transfer rate.

When possible, keep your faster hard drives together on the primary channel and away from CD-ROM or CD-RW drives. If you can afford it, consider RAID 0—two drives and a controller configured for striping—for a higher transfer rate on large, sequential I/Os (don't

Your most urgent upgrade

Our top picks for hard drives are the IBM Deskstar 120GXP and the Western Digital 1200JB (reviewed on page 70). Both drives sport 120GB of disk lovin' and are 7200rpm screamers. The IBM is a touch faster in raw file transfers, but has only a 2MB buffer. The WD1000JB, with its large 8MB cache, would probably be a better fit for video editing and other applications that require large, sequential transfers. Either of these drives will give your PC a nice speed boost, while giving you plenty of space for your applications, games, and scans of erotic French postcards.

expect a noticeable difference with small, random I/Os). If you do heavy file-to-file processing or copying (as in multimedia editing), minimize head movement and boost speed by putting the input and output file sets on different drives.

It's essential that DMA is enabled for each of your hard disk drives within the Device Manager. The procedure varies by OS version. In Win9x or WinME, right-click My Computer, select Properties, then click the Device Manager tab. From here, select Disk Drives from the tree, and double-click your hard disk. Go to Settings, and make sure DMA is checked. In Win 2000 or WinXP, you need to enable DMA by right-clicking My Computer, selecting the Hardware tab, and clicking Device Manager. Click the IDE ATA/ATAPI Controllers tree, and double-click the Primary IDE Channel. Click the Advanced Settings tab, and make sure Transfer Mode indicates "DMA if available."

A couple more tweaks: If you're using anything but Windows XP, don't forget to defragment your hard drive often (Windows XP does routine maintenance on its own in the background). Over time, addition and deletion of hundreds of files causes them to be broken into many small pieces. A defragmenter reunites file chunks, giving you faster boot times and faster overall system performance. If you're using Windows XP, its file system is more effective if your drive isn't partitioned (in contrast to previous versions of Windows that benefited from partitioning).



IBM's reliability record notwithstanding, the new 120GB 120GXP bests even Western Digital's 1000JB drive (with an 8MB cache) in many tests.



INTERNET CONNECTION

Dost thou fear the low ping?

When Jon first saw it in action, he broke into a giddy grin and cleared 2GB off his hard drive to prepare for his new MP3 collection. When Gordo first got it, he visited an orgy of destruction upon his favorite *Tribes* server. And Will? Well, it's best not to say what Will did. This is *Maximum PC* not *Penthouse*, after all.

Word to 56k's mother: A broadband net connection will absolutely, unequivocally, as-if-by-magically change your life. In fact, a blazingly fast, always-on net connection should enhance your PC experience more profoundly than any technical advancement since the advent of Windows 3.1—yes, it's really *that* dramatic. Whether you choose cable or DSL, you'll smash two gnarly bottlenecks. First, you'll decongest your PC's slowest data pipe, and second, you'll never have to manually fire up your net connection ever again—as soon as you switch on your PC, you're connected online, no questions asked.

First let's talk about the speed of your 56k modem connection, which really runs at 53Kbps downstream. Its speed equals about 0.007MB/sec of throughput, which falls behind even the silly-slow 0.028MB/sec capacity of a serial bus connection (which receives its own indictment on page 35). A fast DSL connection, meanwhile, runs downstream at around 1.5Mbps (megabits per second), which means it's about 28 times faster than your 56k dialup modem.

What's more, in broadband terms, DSL is dog-slow compared to cable (though, with cable, you do have to share your gigantic bandwidth with everyone in your neighborhood). Cable

Efficient Network's foxy SpeedStream 5260 is one of many DSL modems you can pair up with an ADSL connection.

modems top out at around 27Mbps, which makes cable around 500 times faster than your puny dialup, in best-case scenarios. In real-world terms, this means that the 120MB of MP3s that required 14 hours to download with your analog line would have taken less than 10 minutes with a broadband connection.

Download speeds aren't the only thing that improves when you shift to broadband; your ping times in online games will also improve. Your ping reflects the length of time it takes for data to travel back and forth between your PC and the game server. In a nutshell, the ping is the length of time it takes for your actions—such as firing a rocket—to actually happen in the game, and is usually reported in 1/1000ths of a second. This means that if you have a 500ms ping, you'll need to anticipate enemy actions about half a second in advance. While this doesn't seem like much, in hardcore first-person shooters, half a second can be the difference between life and death.

So what can you do to break the 56k bottleneck? Step one: Order up some broadband lovin'! Step two: Enjoy the first day of the rest of your life.

Unfortunately, if your cable company isn't offering Internet service, and you don't live within 18,000 feet of the phone company "cen-



tral office," cable and DSL are probably out of the question. So what else can you do? Well, for starters, you can ditch your Winmodem, if you happen to be so afflicted.

Winmodems use your CPU, instead of dedicated hardware on the modem itself, to process the transfer of data packets. Because they don't use dedicated chips, they're prone to unpredictable ping spikes (i.e., your ping shoots up for several seconds then returns to normal) and packet loss (i.e., bits of data sent between you and the server are totally lost). Packet loss is particularly apparent when playing multiplayer games online, because your CPU is already under a full load trying to crunch physics, AI, and polygons.

Fixing the problem is as easy as buying a new modem. Just don't buy any modem that's labeled as a "Winmodem" or as "controllerless." We recommend the U.S. Robotics 56K Performance Pro Modem if you're looking for reliability.

Fun things to smoke through your fat pipe

Walk with us down Broadband Wonderment Lane. Your newfound possibilities include:

■ **Downloading an album's worth of MP3s without going gray** Fire up Kazaa and download the entire *Glitter* soundtrack, just like Logan did. Don't worry, it's such a bad album, no one will care that you're outright stealing it! *56k time: a virtual eternity. Broadband time: a mere bathroom break.*

■ **Playing a game without getting schooled** Load your favorite multiplayer shooter and maim a dozen new friends. If they're all playing on modems, your advantage will be huge! *56k ping: 350. Broadband ping: 50.*

■ **Watching streaming video without going insane** That's right, with a DSL or cable connection, you can watch those CBS.com "Survivor"

exit interviews at their highest quality settings and without transfer hiccups. Same goes for pretty much all streaming media of every creed and color. *56k frustration: immeasurable. Broadband frustration: never heard of it.*

[Are you seriously thinking about broadband now? If so, see this month's DSL Q&A on page 50.]



CPU

Is it time for a brain transplant?

Busting bottlenecks isn't just about yanking out the slow components that are strangling your PC's performance.

After all, not every component comes into play when you're working in *Photoshop* or digitizing video. Nope, you've also got to raise the bar on your PC's maximum performance, and this begins with your CPU.

The most popular CPU performance metric is still clock speed, but if you've been following the CPU wars, you know that AMD and Apple have been fighting to debunk the "megahertz myth." Intel may have more clock cycles, but that doesn't necessarily translate into better performance—or so the argument goes. In some respects, the Intel-haters are correct. For example, in our *Adobe Premiere 6* benchmark,

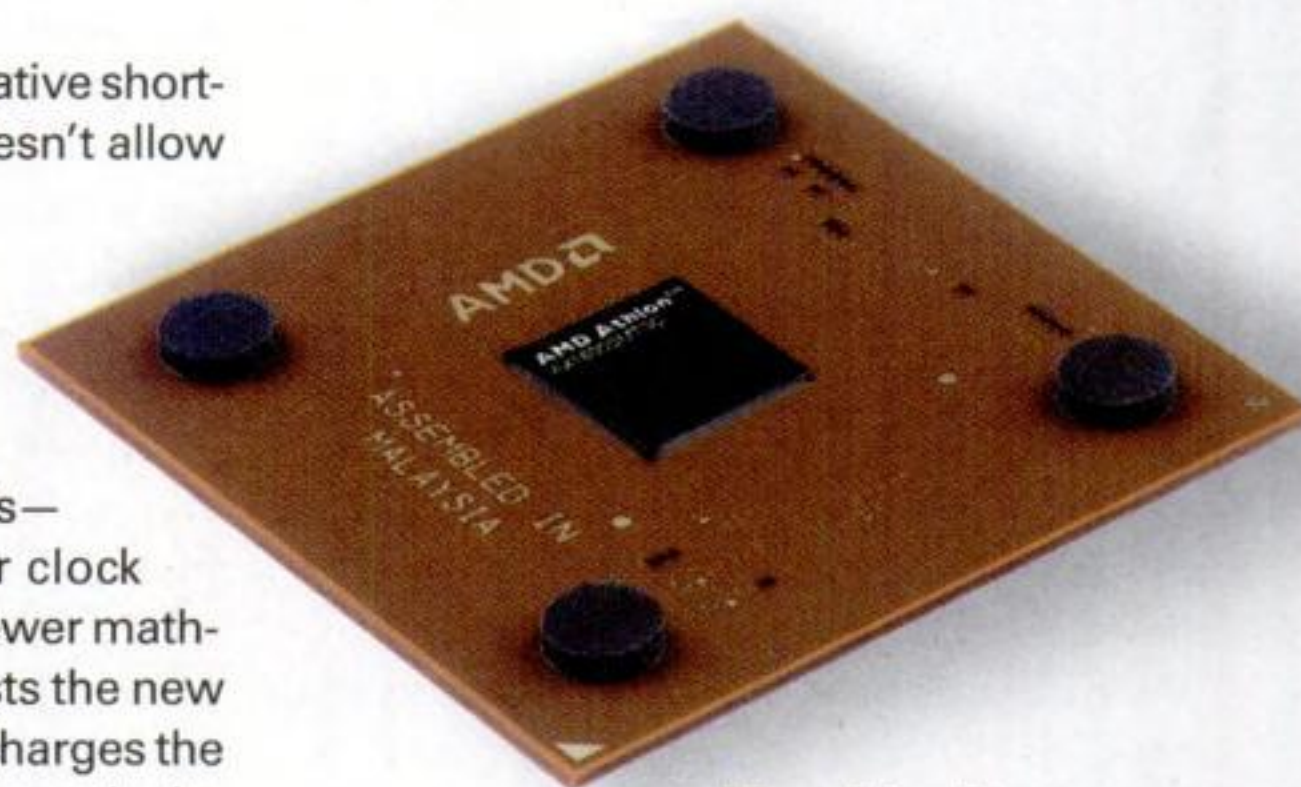
and media editing apps, but the relative shortness of its processing pipeline doesn't allow for P4-level clock speeds.

The P4, meanwhile, features just a single floating-point unit and two integer units, but has an extremely long pipeline built in to reach incredibly high clock-speeds—and in some applications, sheer clock speed can mitigate the impact of fewer math-processing units. The P4 also boasts the new SSE2 instruction set, which supercharges the hell out of floating-point and integer calculations in apps that support the instructions.

Unfortunately, even special instructions can't negate the fact that the P4's long pipeline actually hinders the benchmark performance of common office apps. But can anyone legitimately notice "performance bottlenecks" when typing in *Word*? Probably not. In fact, Intel would argue that what consumers really need are special instructions—like SSE2—that provide an edge in gaming, media encoding, and other such new-age pursuits.

Special instructions—such as Intel's SSE and SSE2, and AMD's 3DNow! Pro—greatly boost a CPU's processing speed. In simple terms, they can perform one instruction on multiple pieces of data, effectively doubling and even quadrupling processing speeds for the number-crunching at hand. AMD has had limited success with its 3DNow! Pro instruction set (in large part because so few non-gaming applications support it), but the new Athlon XP family actually includes SSE support, and AMD has stated that it will adopt SSE2 when it releases its Hammer line of CPUs later this year. As more applications are updated to support SSE and SSE2, your CPU will actually "get faster" as time goes on.

Bus speeds also affect the speed of a CPU and your system in general. The Pentium III CPU officially supported bus speeds of 100MHz and 133MHz. AMD's Thunderbird Athlon employed 200MHz and 266MHz DDR bus speeds, and the Pentium 4 exclusively uses a 400MHz (quad-



Thumbing its nose at pure clock speed, AMD's

fastest Athlon XP can best even Intel's fastest P4 in some applications.

rate) bus today. In some cases, system bus increases can have a larger impact on a PC's performance than pure CPU clock speed increases. By increasing the bus speed, you increase the bandwidth and thus the transfer rate from the CPU to the PC's main memory and chipset.

The Pentium 4 is expected to get a boost later this year when Intel bumps its frontside bus from 100MHz to 133MHz, for an effective 533MHz of bus speed. That said, increased bus speeds are valuable, but they may not necessarily warrant a full motherboard-level overhaul. For example, if you're running a 1GHz Thunderbird Athlon on a 100MHz bus with the KT133A chipset, it wouldn't make sense to upgrade to a 133MHz frontside bus with that same 1GHz CPU. On the flipside, a jump from 1GHz to 1.4GHz on the 133MHz bus would indeed give you a worthy performance boost. The lesson is to exercise common sense when upgrading your CPU, and anything less than two or three frequency jumps is hardly worth the effort.



The Northwood version of the P4 ups the L2 cache to 512KB and uses a smaller 0.13-micron process that runs cooler and faster.

a 1.67GHz Athlon XP will smoke even a 2.2GHz Northwood Pentium 4. But then in *MusicMatch*, an MP3 encoding app, that same Pentium 4 will leave the Athlon XP wondering if it started the race with its gearshift jammed.

The performance disparities are usually tied to core architecture differences among the various CPUs. For example, the Athlon XP has three floating-point units and three integer units. It's a burly processor that throws no fewer than six processing engines at games

Your most urgent upgrade

If you're running any CPU architecture less advanced than the Pentium 4 or Athlon XP, you could stand an upgrade—gaming, media encoding, and media editing should all perform noticeably faster. The Pentium 4 Northwood is generally better suited for audio and video encoding. And like we've previously stated, apps that may limp on the P4 today will possibly scream on the CPU a year from now, when the software is re-coded to support SSE2. But if you're more interested in speeding up the apps you already own, the Athlon XP probably makes more sense. If you put a 1.5GHz P4 against a 1.5GHz Athlon XP, the Athlon XP would best the P4 in most tasks.



MEMORY

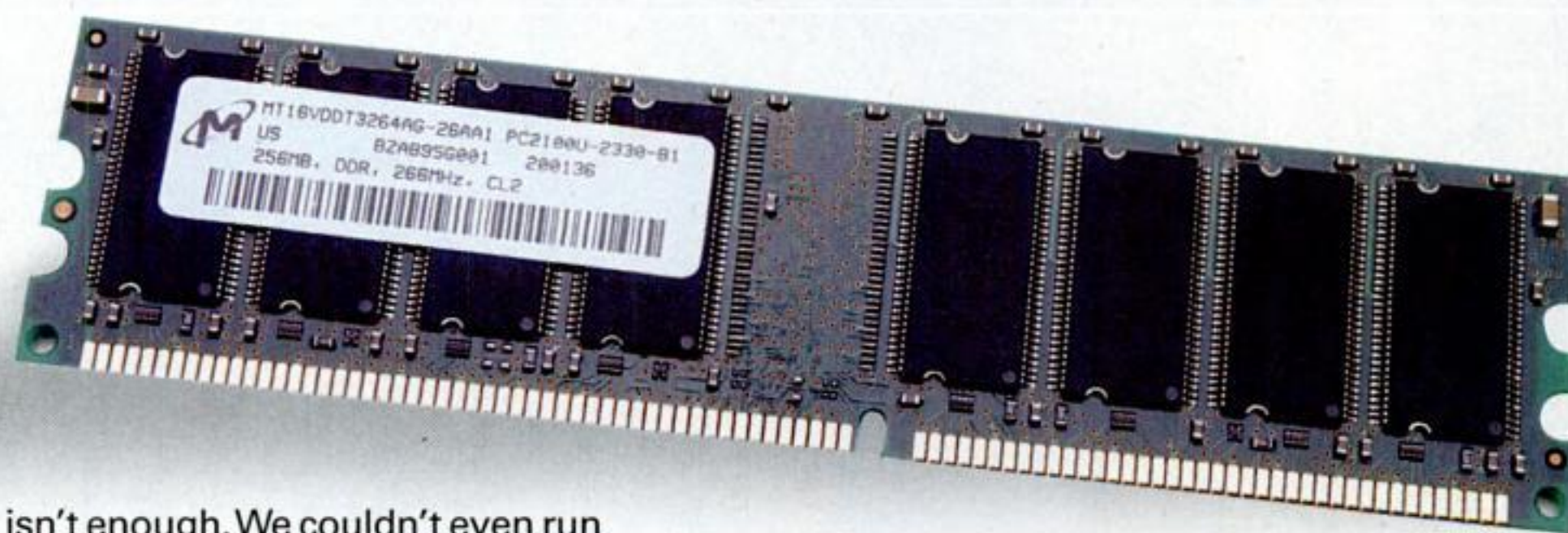
Don't shackle your PC with dog-slow RAM

Your CPU may be a multimillion-transistor genius, but it can't remember a damn thing. Instead, it relies on your system memory (and, as a last resort, your hard drive) to store information and calculations, and to keep tabs on what's going on within your PC. So it should come as no surprise that, as far as RAM is concerned, faster is better, and the more the merrier.

First, let's address the amount of system memory you're running. Let's say you've got 128MB total. About 112MB will be consumed by loading Windows 98SE, your antivirus software, networking software, and other system detritus you've built up. Now you load *Photoshop 5.5*, which has about a 22MB memory footprint. Boom! You've already exceeded your 128MB total memory capacity. Load a 25MB image file, and you'll be shagging the swap file on your hard drive silly. See, when your system runs out of main memory, Windows begins swapping data to your hard drive rather than simply grinding to a halt. And because it takes a PC much more time to grab information off a mechanical hard disk than it does from solid-state system memory, performance will plummet faster than Gary Condit's approval ratings.

Dig: According to memory manufacturer Kingston, something that takes three and a half minutes to access in RAM would take *four and a half months* from your hard disk.

Keeping swap file activity to a minimum is simple—just add more memory. In our January "Speed Issue," we conducted several tests to find out how memory capacity affects the performance of Windows XP. Not unexpectedly, we found that 128MB just



isn't enough. We couldn't even run some of our tests with 128MB, and other tests took massive performance hits. So where's the sweet spot? Well, 256MB and sometimes 512MB should make most PCs as happy as clams. But don't get greedy, especially if you're using an older OS. Win95/98/ME don't effectively use more than 256MB. Windows 2000 and XP, however, can use up the maximum 4GB of RAM without problems.

Now let's talk speed. Consider that when the 333MHz Pentium II was introduced, main system memory ran at 66MHz. Since then, CPU speeds have rocketed to more than 2.2GHz, but most people run main memory that puts around at 133MHz or 266MHz. Sure, RAM is still one of the fastest components in your PC, but relative to your CPU—the one component to which it's inextricably married—it represents a vicious bottleneck.

So logic dictates that you probably need to increase your memory speed. There are essentially three types of memory currently available—SDRAM, DDR SDRAM, and RDRAM—but unless you have a true freak of motherboard nature, your current motherboard will support only one of the three memory types. Thinking of replacing your mobo in order

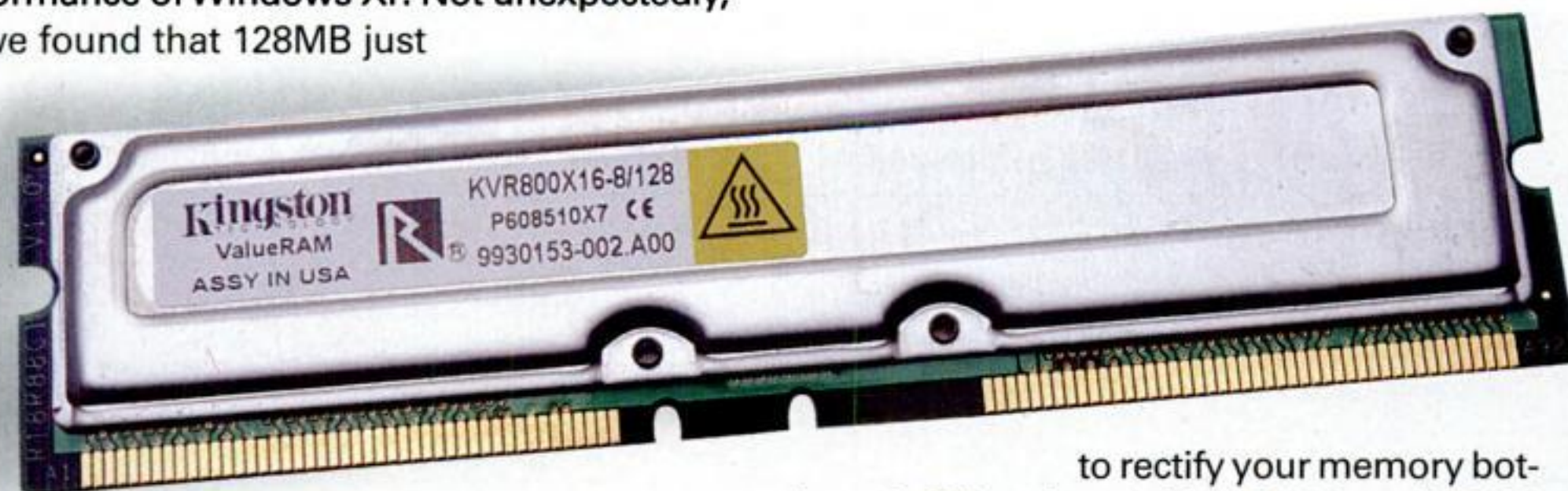
PC133 SDRAM may be cheaper, but it's not a viable memory type for Athlon rigs compared with the DDR memory pictured here.

past 2.2GHz, so you may want to invest in an RDRAM motherboard infrastructure if you plan on keeping your P4 rig for a while.

DDR266 peaks at 2.1GB/sec of bandwidth, while RDRAM peaks at 3.2GB/sec, and it's this extra performance that keeps the faster P4s loaded with a steadier stream of data. However, the emerging DDR333 will increase bandwidth to 2.7GB/sec; when it's ready for prime time, we'll let you know if it can meet the RDRAM challenge in P4 systems. Of course, RDRAM will also be scaling faster, care of PC1066, which will offer roughly 4GB/sec of bandwidth.

As you can surmise, there are numerous speed variations within each memory family. SDRAM comes in PC100 and PC133, good for 100MHz and 133MHz, respectively. DDR SDRAM comes in 200MHz and 266MHz flavors, and RDRAM ships in PC600 and PC800. *If your motherboard supports a faster memory type, upgrade now.* Check your mobo manual for specifics. And please note that most of today's current motherboards will likely *not* support PC333 and PC1066; you'll need to start from scratch to enjoy their speed dividends.

Finally, another factor that affects memory speed is known as "column access strobe (CAS) latency." CAS latency defines the time it takes for a CPU to address a column in the memory. Think of memory as a huge *Excel* spreadsheet with data spread across it—CAS latency expresses how long it takes the CPU to scan the contents of this spreadsheet and locate the correct data. CAS latency is usually expressed as 2, 2.5, or 3 clock cycles. Go for the smallest number possible; it means the memory is capable of being accessed faster and generally means the CPU won't sit around waiting as long. And that means the rest of your hardware won't either.



If you're shopping for a Pentium 4 motherboard and you're confused about what memory to buy, reach for one that supports RDRAM. It's proven to offer more speed than the current DDR boards on the market.

to rectify your memory bottlenecks? Then know this: PC100 and PC133 will severely bottleneck all modern CPUs. Your only legitimate options are DDR (for AMD Athlons and some Intel Pentium 4s) and RDRAM (which runs only with Pentium IIIs and 4s). For what it's worth, it looks like DDR creates bottlenecks in the Pentium 4 as the CPU scales

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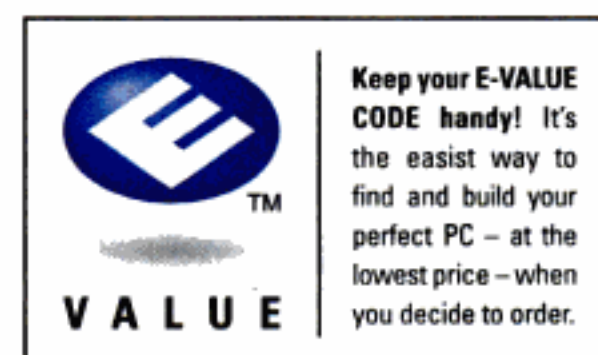


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MOTHERBOARD BUSES

Do you have the right slot?

Unless you're willing to yank out your motherboard and start from scratch, you're stuck with whatever expansion buses were standard at the time you bought or built your PC. But that doesn't mean there's nothing you can do. It's your obligation as a PC power-user to make every effort to migrate your subsystems to your motherboard's advanced slots and eliminate old, legacy hardware that could be dragging down performance. Your first target should be eliminating anything—most likely an old soundcard—sitting in an ISA slot.

ISA, which stands for "industry standard architecture," harks back to the original PC, and in its fastest configuration, offers a pathetic 2.4MB/sec of bandwidth. Because of the ISA bus's limitations, most ISA soundcards support no more than four simultaneous audio streams. Even worse, if you're using an ISA soundcard for gaming, you could be missing out on a whole universe of realistic sound effects that were introduced in PCI soundcards (for example, the effects made possible by EAX and DirectSound3D). Bottom line: Your ISA soundcard must be replaced with a PCI soundcard. (The PCI bus offers a downright fat pipe at 133MB/sec.)

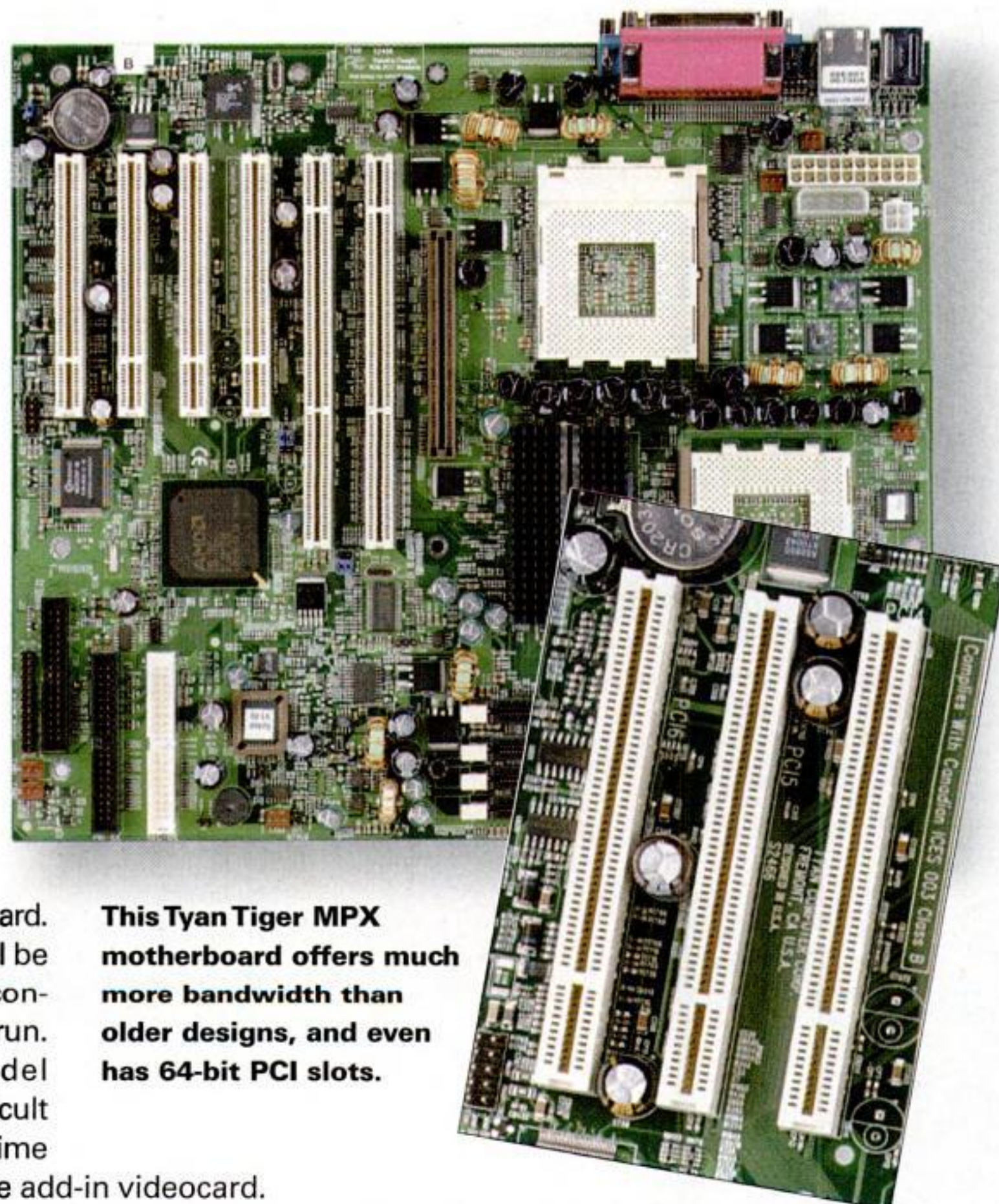
Integrated audio is also an evil force. What we're talking about is audio circuitry that's soldered directly to the motherboard, instead of sitting on an add-in card that's stuck in an expansion slot. Most integrated audio chips are wont to tap the host CPU to handle audio processing chores, and this can cause a bad bottleneck. Granted, you shouldn't assume that all integrated audio is weak. Because new motherboard chipsets use completely different architectures than the chipsets sold three years ago, some integrated audio might actually perform *better* than PCI soundcards when it comes to latency and performance. For example, Analog Devices says its SoundMAX

chip is just as good or better than add-in soundcards. We're also very impressed with the audio processing that's built into nVidia's nForce core-logic chipset; it can more or less supplant the need for an add-in soundcard. Nevertheless, most motherboard vendors continue to integrate extremely low-cost audio components, so we're still comfortable stating that most onboard audio sucks and should be avoided.

Next up, onboard graphics. PCs older than three or four years might have graphics chips embedded in the motherboard. These chips might as well be called 3D *de*-celerators, considering how slowly they run. Even worse, early-model onboard graphics are difficult to disable when it comes time to upgrade to a legitimate add-in videocard. If you have an old motherboard with onboard graphics, chuck the whole damn thing.

These days, it's far more common for motherboard chipset vendors to integrate video and 3D processing features directly into their core-logic chipsets—the nForce, for example, includes GeForce2-level 3D acceleration. Unfortunately, most integrated graphics don't even approach this level of 3D power, and should be avoided. Even a \$130 ATI Radeon 7500 will more than quadruple the performance of most integrated graphics chipsets. In fact, if your video subsystem isn't riding the little brown slot just north of the white PCI slots, it's almost definitely time to upgrade. This brown slot, called the "accelerated graphics port," was introduced to the PC world in 1997 and paved the way for the increased bandwidth that today's games require. AGP gave the video subsystem its own private data road to the CPU/memory subsystem and increased bandwidth to just over 1GB/sec in AGP 4x motherboards. An upgrade to AGP 8x later this year will double the graphics bandwidth yet again to about 2GB/sec.

And what about your IDE bus? You've prob-



This Tyan Tiger MPX motherboard offers much more bandwidth than older designs, and even has 64-bit PCI slots.

ably heard hard drive companies proclaim speeds of up to 100MB/sec or 133MB/sec using new ATA/100 or ATA/133 technology. Unfortunately, this is one category where hype has exceeded reality. ATA/33 means your rig can theoretically transfer hard drive and optical drive data at 33MB/sec. ATA/66 ups the ante to 66MB/sec, and so on. Unfortunately, few hard drives can actually physically transfer enough data to reach the limitations of the IDE bus. Does this mean you should stick with an ATA/33 hard drive? No—hard drive manufacturers automatically step up to the latest bus specs, which means the fastest hard drives in terms of rotation and access speeds are all ATA/100 or ATA/133 anyhow. We should also note that even though today's hard drives can't *sustain* speeds of 100MB/sec, they can occasionally *burst* that much information across the interface—especially drives that pack large caches. In Lab tests, we've seen ATA/133 hard drives pushing the envelope at 100MB/sec. And when we're trying to bust bottlenecks, those are the kinds of numbers we like to see.

Your most urgent upgrade

If your system lacks a soundcard and simply relies on an integrated audio solution soldered to the motherboard, you should immediately upgrade to a killer add-in soundcard like Creative Lab's Sound Blaster Audigy. It will free up CPU resources and give you all the audio special effects available in today's games.



VIDEOCARDS

Low frame rates equal online death

During a round of deathmatch, nothing sucks worse than suddenly suffering a massive frame rate slowdown, then returning deader than fried chicken when your control springs back to life. Are you tired of wearing your ass for a hat because your PC can't keep up with the rapid-fire pace of today's first-person shooters? Losing a round of deathmatch is bad enough, but losing because of a hardware handicap is just plain silly.

Solution: Optimize your 3D acceleration *now*.

Notice how we use the term "3D acceleration" instead of putting all the blame on your videocard. We use the blanket term because there are actually three main villains in the slow frame-rate melodrama: slow videocard chipsets, under-performing CPUs, and insufficient main system memory. An extreme deficiency in any one of these three subsystems can cause massive slowdowns, and even a minor shortcoming can have a measurable impact. To understand the whys and hows, you need to understand how 3D games are rendered. So let's follow along and track the progress of a non-programmable 3D game environment being rendered on a videocard that boasts a transform-and-lighting engine, such as the GeForce or original Radeon. (Programmable shader games suffer slightly different bottlenecks, but since they're still extremely hard to find on store shelves, we'll just pretend they don't exist for the purpose of this discussion.)

Step One Way before any textures hit your screen, the game taps your CPU to calculate all the vertex details of the scene to be rendered. Everything—from the positions of rockets and players, to the shapes of trees and rock formations, to whether doors are opened or closed—is calculated for each frame that's drawn. Your CPU also crunches all the processing required for network communication, physics modeling, and artificial intelligence. At this point in the process, everything in the scene is stored in your main system RAM. Potential bottlenecks: If your CPU isn't powerful enough to instantaneously make its calculations, or if your rig doesn't include enough RAM to store scene data (and thus has to place the data in the swap file on your hard drive), then your game is going to resemble a filmstrip.

Step Two Next, all the data from step one is passed from system memory to the memory

soldered on your videocard. Again, if you don't have enough system memory (and have to troll the swap file), or if your system memory

fastest CPU, and have 2GB of memory, there's definitely something you can upgrade to juice a few more frames per second out of your

Your most urgent upgrade

	RUN TO THE STORE NOW	UPGRADE SOON	NO NEED TO UPGRADE
System RAM	64MB	128MB	256MB
CPU	500MHz	1.6GHz	2.0GHz
Video RAM	8MB	32MB	64MB

If you're running a CPU slower than 1GHz, have less than 256MB of system memory, or are running a 3D accelerator that's less advanced than the GeForce2, upgrade the slow part right this second. (And, of course, if you want to play shader-based games, you'll need a Radeon 8500, GeForce3, or GeForce4 Ti.)
If you aren't sure what part you should upgrade to

boost your 3D frame rates, take a look at our chart. Each of the three bars represents one of the three subsystems that can slow down your games. If your current PC falls into any or all of the Upgrade Zones, you need to upgrade ASAP. If you need to upgrade more than one category, start with your worst category and work your way up from there.

is just plain slow (like, say, PC100 SDRAM in this age of PC2100 DDR), your frame rates will grind to a crawl.

Step Three Now that the scene data is in your 3D accelerator's memory, your GPU (i.e., the 3D accelerator chip that makes your videocard so damn special) composites your scene, then lights each vertex of every model in the scene. At this point, any slowdown is the fault of your GPU.

Step Four Textures are now applied to the scene's polygons, giving the game's environment and character models a realistic appearance. Applying a texture to a polygon is akin to wrapping a rubber sheet around a large metal frame. At this step in the process, slowdowns are usually caused by a slow memory pipeline between the GPU and its attendant video memory.

Step Five The GPU writes everything to its frame buffer, which resides in onboard video memory. Next, everything that's in the frame buffer is sent to your monitor. If your videocard's RAMDAC isn't fast enough to drive as high a resolution as your monitor supports, you can definitely be bottlenecked.

As you can see, a number of potential bottlenecks could be choking your performance. Unless you own the fastest GeForce4, the

most punishing games. For example, if you're running a GeForce4 on a P-III 733MHz system loaded with just 128MB of the slowest RDRAM, your rig won't have any trouble actually rendering textures, but it'll have a bitch of a time processing a lot of high-detail character models in a single scene.

One final word on 3D bottlenecks: Back in the old days, if a game's resolution and texture complexity tossed forth more pixels than a 3D chipset was capable of processing, then the chipset was considered "fill rate limited." Fill rate is the raw number of pixels that a 3D accelerator can draw onscreen each second, and is usually expressed in terms of millions of pixels per second (Mpixels/sec). Today, all 3D chips more advanced than the GeForce2 have enough fill rate to render the high resolutions and textures in today's most complex games. What's more, all things being relative, fill-rate requirements have been lessened somewhat because game developers are now turning to more complex models, rather than intense multi-texturing effects, to add realism to games. This puts the burden on your CPU rather than your videocard. For this reason, video memory bandwidth—and not fill rate—has emerged as the videocard's most significant bottleneck.



OPERATING SYSTEM

Give the Borg Queen of your PC a makeover

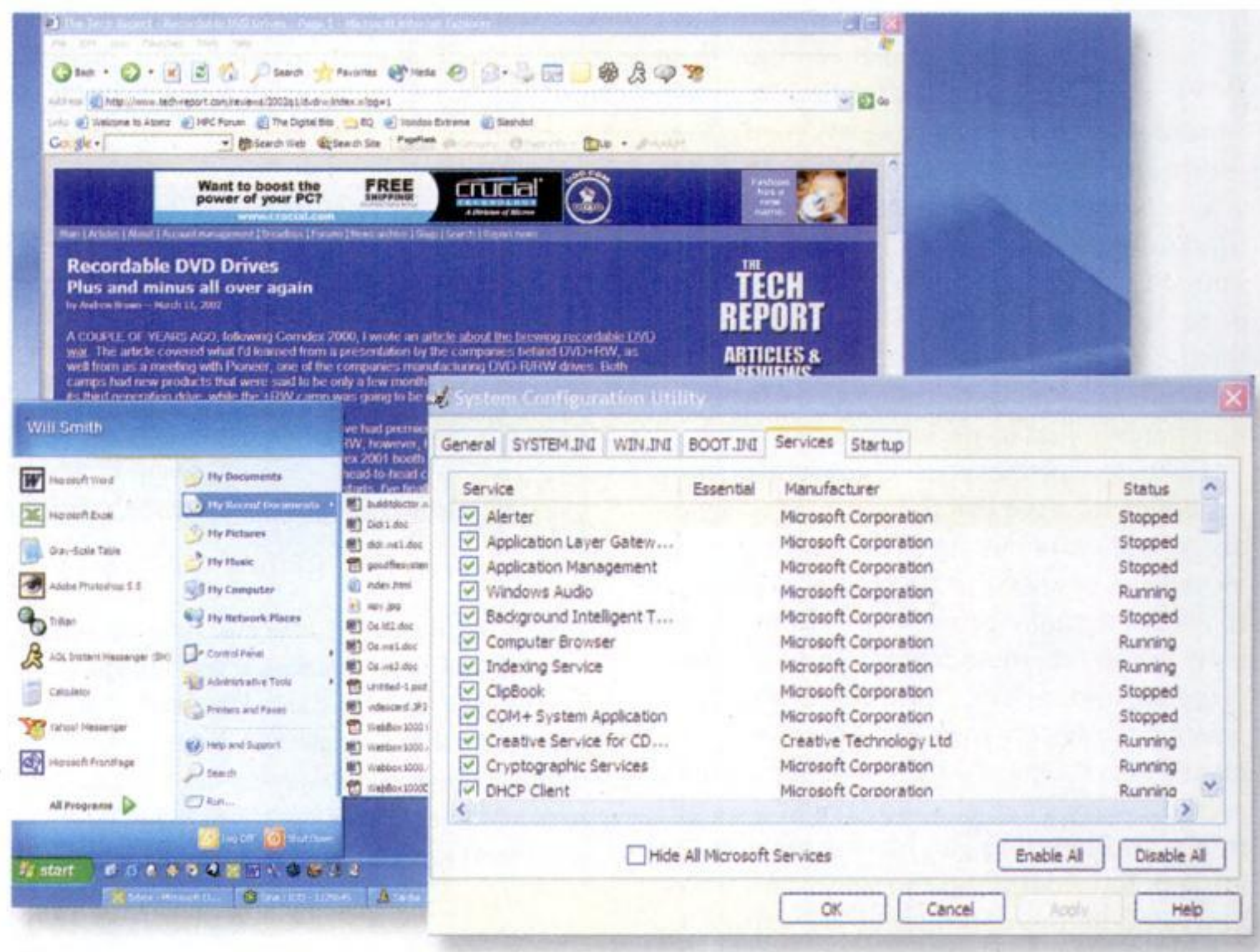
A crash-prone or slow OS can hamper every single thing you do with your PC—work, gaming, web surfing, and even deleting evidence from your hard drive. In effect, it's the ultimate bottleneck, in at least two ways.

Inside of your PC, the OS influences how efficiently your hardware resources are used, safeguards your data (and, in some cases, jeopardizes it), and determines whether you're able to take advantage of the latest technologies and innovations as PCs evolve. Additionally, slick features such as multi-threading and preemptive multitasking have exponentially increased how much we simultaneously do with our hardware.

Outside of your PC, the graphical user interface strongly influences how efficiently you work. It took years for Microsoft to get it right, but if you've already traded up to WinXP, you know what we mean.

Unlike previous versions of Microsoft's consumer OS, WinXP is based on the pure 32-bit kernel of Windows NT, a "workstation" OS. By tossing out all the legacy crap that let you run 8-year-old apps on WinME, Windows XP is much less crash-prone—how's that for bottleneck-busting? WinXP also includes a better memory manager that prohibits unruly apps from crashing your entire system when they go down, as well as an improved file system, a tasty new interface, and a whole raft of other enhancements.

WinXP's improved hardware support could clean up a lot of support bottlenecks right out of the box. Win95 and even the first release of Win98 offered inconsistent AGP support and very poor USB support. WinNT4 offered



If you're shopping for a new OS, there's really only one place to stop, and that's Windows XP.

no support for USB devices or the FAT32 filesystem, while WinME and 98 didn't include NTFS support at all. So if you want to use all the advanced features that, for example, a Bluetooth device can offer, you'll almost certainly need to run WinXP.

OK, by now you should be fully sold on the purchase of a brand-spanking-new version of WinXP—but not so fast. The very OS that can relieve bottlenecks might also *cause*

bottlenecks if you're not prepared to take delivery. If your system isn't beefy enough to support WinXP's considerable system requirements, you might end up with a slower PC than before. A reasonably powerful computer (1.2GHz CPU and 256MB of memory) loaded with WinXP should be able to run apps as fast or faster than the same computer loaded with WinME/98. However, if you try to upgrade your old hand-crank 486SX (assuming that it even runs), installing WinXP would permanently cripple this already asstastic machine.

Microsoft's official maxim is that if you bought your PC before January 2000, you shouldn't try to upgrade to WinXP. Of course, we think it's a little more complicated than that. We know all sorts of high-end PCs bought before then that could easily run WinXP, and multitudes of cheapo PCs sold after January 2000 that still gag on Win98SE. According to the *Maximum PC* playbook, before you even consider running WinXP, you need at least an 800MHz CPU and 256MB of RAM. And to run WinXP the right way, you need to have a 1.2GHz processor and more than 256MB of RAM.

How to clean your system tray

If your current OS is keeping you from a productive PC lifestyle—because it's crash-prone, because it doesn't support the hardware, peripheral, or apps you want to use, or because it's just too damn slow—you need to seek help. First, if you want to upgrade your old OS, be it Windows 98, ME, NT, or 2000, the only sensible purchase at this time is Windows XP. No other OS has the stability, performance, and features. Period.

If you're happy with the OS you have, but think that it's become sluggish since you began using it, there's a quick method of cleaning house. While an explanation of

all the tweaks and cleanup tips available to each OS is beyond the scope of this article, we can advise you how to remove the software lint from your System Tray; this is pretty much a universal cure-all. All you need to do is fire up msconfig (go to Start, Run, then type msconfig.exe and press Enter) and go to the Startup tab. From there, you can selectively disable any of the unnecessary TSR (terminate and stay resident) programs that automatically load when you start your system. Getting rid of useless TSRs frees up memory, can prevent software-based conflicts, and even makes your OS boot faster.



EXTERNAL I/O BUSES

Hasta la vista, parallel! Sayonara, serial!

Not all of today's upgrading excitement is limited to meat-and-potatoes components like hard drives and videocards. In fact, just about every day we find a new toy to plug into—but not inside of—our PCs. So whenever we hear chatter about eliminating the PC's legacy ports and moving toward faster, less finicky connection standards, we applaud wildly. Parallel and serial ports have long worn out their welcome in PC land.

The universal serial bus (USB) is undoubtedly one of the best new technologies for connecting external peripherals. While Apple Computer would like people to believe that USB magically appeared out of the iMac's butt, it was actually Intel that crafted the spec in the mid-1990s. USB 1.1 debuted with connection speeds of up to 12Mbps, which is about 1.5MB/sec. This is far greater bandwidth than the pathetic 15K/sec that the average serial port offers, but slightly less than the fastest parallel port speeds of 2MB/sec. USB's real strengths, however, are its support for up to 127 devices on a chain, plug-and-play that actually works, and the ability to "hot swap" components (that is, being able to add and remove peripherals without having to first power down your PC).

To its credit, Apple was the first company to get USB ports and USB devices to work together reliably. USB was horribly broken under Windows 95, and it really wasn't until Windows Millennium and Windows XP that the standard fully matured for PC users. In fact, while USB was going through its teething pains, Apple and Texas Instruments introduced the IEEE-1394 spec, commonly referred to as "FireWire." A high-speed serial interface, FireWire pushes about 400Mbps (that is, about 50MB/sec) in its fastest configuration. If you

If you just upgraded your PC to USB 2.0, check out Plextor's new 24/10/40U. While USB 1.1 CD-RW drives were limited to 4x burns, the USB 2.0 Plextor will crank out a disc at 24x.

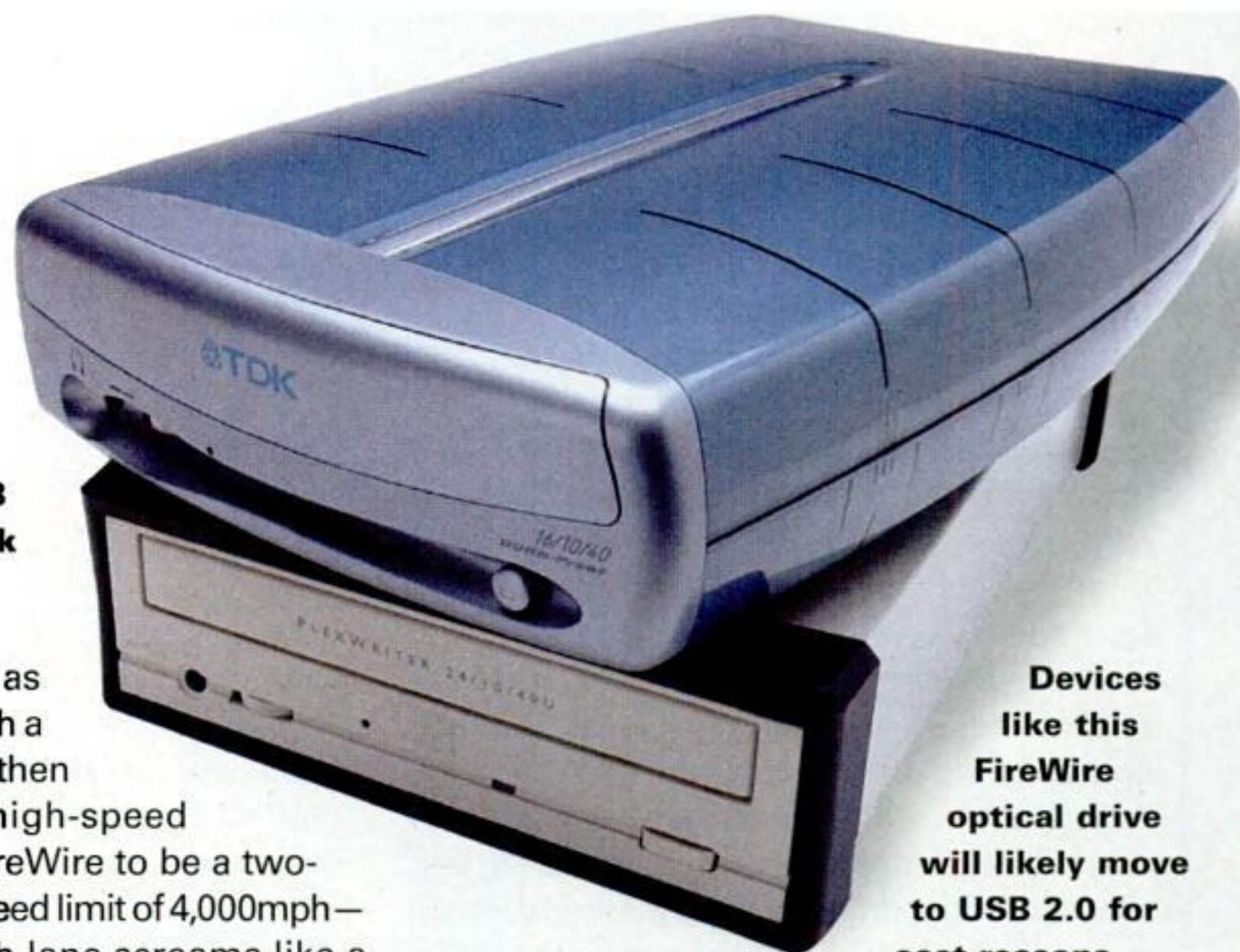
think of a parallel port as a six-lane highway with a speed limit of 55mph, then you can consider a high-speed serial interface like FireWire to be a two-lane highway with a speed limit of 4,000mph—fewer lanes, but each lane screams like a straight at Hockenheim.

FireWire is primarily known for its implementation in digital video gear, and is the interface of choice for transferring video to a host PC and vice versa. FireWire is device independent, so two FireWire DV cameras can be attached together for transferring footage without the need of an intermediary PC.

As one might assume, FireWire's device independence doesn't sit very well with Intel, which has a vested interest in establishing the PC as the center of everyone's technological universe. And, of course, no PC vendor was happy with Apple's attempt to impose a per-port FireWire licensing fee. So Intel shot back with a revision to USB that finally began to pick up some traction late last year. USB 2.0, or high-speed USB, puffs the USB spec to speeds of up to 480Mbps, which is about 60MB/sec. It's tempting to cheer for one standard over the other, but the truth is that FireWire and USB 2.0 will likely coexist, and probably should. DV companies will continue to ship cameras with FireWire, while CD burners and hard drives will mostly gravitate toward USB 2.0.

OK, but which one is *better*? That's a tough call—both standards have their strengths and weaknesses. FireWire has always offered isochronous modes, which guarantee that video data will be sent without dropped frames, or out of sync. FireWire will also get a bump from a new "b" spec that will initially double, then triple and quadruple, its speed to 3.2Gbps.

USB's main strength is its ubiquity and



Devices like this FireWire optical drive will likely move to USB 2.0 for cost reasons.



cost. USB 1.1 support has been included in most PCs built in the last four years. And soon enough, VIA and Intel will include USB 2.0 support in all their motherboard chipsets, paving the way for USB 2.0 in all new PCs. The sweetest advantage, though, is that USB 2.0 is backward-compatible with USB 1.1. This means that USB 2.0 devices will work on far more PCs than will devices that rely on FireWire (though, of course, your speeds will drop down to the USB 1.1 spec).

If you're wondering if it's worth it to upgrade from USB 1.1 to USB 2.0 using a PCI add-in card, just do it the moment the need hits you. The cards are relatively inexpensive, and you'll definitely want the increased bandwidth for the next wave of PC peripherals.

Regardless of whether you adopt just one standard or both, the best thing about USB 2.0 and FireWire is leaving behind those can-tankerous parallel and serial connections.

Your most urgent upgrade

Why stick with one connection, when you can have the best of both worlds? Adaptec's DuoConnect (\$130, www.adaptec.com) features four backward-compatible USB 2.0 ports and two plugs of hot FireWire love. Meanwhile, the Pottery Barn crowd will almost certainly go wild for Adaptec's Xhub4+ (\$90), a four-port USB 2.0 hub with cable management and an integrated picture frame. No, we're not making this up.



OPTICAL DRIVES

Don't get burned by your burner!

It's tempting to assume that simply buying a newer, faster optical drive will be the answer to all your optical drive woes. But the performance-rating specs plastered on drive boxes are deceptively simple, and even if you buy a 16x DVD-ROM drive, a 2.5x DVD burner, or a 40x CD-RW drive (all tops in their respective performance ratings), you still might not see any boost in performance if you're sloppy. While optical drives are rarely the worst bottlenecks, they're also some of the easiest components to misconfigure.

Before you consider upgrading to a faster drive, it's vital to make sure you're getting the most out of the drive you've already got. First, make sure DMA (direct memory access) is checked for all optical drives that support such transfers (see the section on Hard Drives for instructions on how to enable this critical setting). Without getting all techie-poo about it, enabling DMA puts your optical drive on a first-name basis with your system RAM, and frees up all the CPU resources that would otherwise be dedicated to chaperoning data back and forth. If your PC has difficulty keeping your



If you have anything slower than a 16x CD burner, give it to your little sister and trade up to a 32x drive or higher.

drive's buffer full, it's very likely you don't have DMA enabled. (Ahead Nero has a buffer meter that displays your buffer contents dynamically.) Please note that if you have buffer-underrun protection, but have DMA disabled, you'll still be able to successfully write a full disc, but it will be painfully slow.

Your CD media can also be a bottleneck. *Point: The highest return on investment you can get for your optical drives will come from buying high-quality media.* Most CD burners made in the last year check the ATIP (absolute time in pregroove) information of your blank disc against a vast catalog of media stored in their firmware, and will refuse to write at any speed greater than that which the media is rated for. The ATIP is like a dog tag for each disc and tells your CD burner: "Hi! I'm a cyanine dye-based Taiyo Yuden disc that's rated for burning at speeds up to 24x."

So to address the media bottleneck, you should buy high-quality branded media, preferably from the list of recommended media that you'll find in your burner's documentation. For example, Plextor recommends only media from Maxell and Mitsubishi Chemical for 40x writing! This isn't just the result of some shady back-room deal—the Plextor drives have been calibrated and tested at 40x speed with media from these manufacturers. Also, don't forget to update your firmware regularly, as this will also update the drive's catalog of media and probably shine up your drive's performance to boot.

Your burning software may also be weighing down your burner. Our tests have consistently demonstrated a minimum of a 30-second

penalty using Roxio's *Easy CD Creator* instead of Ahead's *Nero* in drives rated above 24x. Ahead's obsessive updating of *Nero* will also keep you far ahead on the feature curve—Ahead is almost always the first company to support the advanced features of new drives, such as Plextor's laser-calibrating VariRec.

So is upgrading to a 40x burner really worth it? It is if you frequently copy full CDs, and thus take advantage of the current 40x burners' ability to write at 40x at the outer edges of a disc (see page 69 for the full details on the Zone-CLV limitation). We should also note that high-speed burners can often extract digital audio at dizzying speeds that exceed 40x. And most 32x and 40x burner also support 12x CD-RW recording—a significant gain over the 8x and 10x speeds of yore.

If your current burner doesn't support buffer underrun protection that's capable of pausing the laser in mid-burn, as Sanyo's Burn-Proof and Yamaha's SafeBurn do, then you need to upgrade right away. No other technology has done so much to make CD-burning effortless.

If you have a 16x burner or slower, you may want to consider trading up to a faster drive—a 40x burner, for example, can burn a full disc in three and a half minutes, two minutes faster than the 16x. After 16x, though, the returns on upgrading diminish rapidly. If you've got a 20x or higher burner, consider upgrading only if you want to increase your CD-RW speeds as well, or if you find that your burner doesn't handle digital audio extraction very well—a feature most drives today excel at because it's what most people want. Are you listening, RIAA?

Your most urgent upgrade

Our current top pick for CD burners is Lite-On's 32x 32123S (\$130, www.liteonit.com.tw). It's a tad slower than the PlexWriter 40x (\$210, www.plextor.com)—by "tad" we mean mere seconds—but it's also much cheaper and comes with Ahead's *Nero*. Audiophiles, however, may want to stick with the Plexy, as it offers optimized circuitry designed to minimize errors when recording to audio CDs. Pioneer's DVR-A03 is still our favorite recordable DVD burner, with DVD-R's vastly superior compatibility among set-top players compared to the other standards.

Since its introduction in 1995, Ahead's *Nero* (\$49 for downloadable version, www.nero.com) has remained far ahead (sorry) of its competitors in CD-burning software, and its aggressive updating and generous upgrade policies virtually guarantee it will remain our favorite burning app for a long time to come.



MONITORS

Don't let screen real-estate slow you down

Whenever a *Maximum PC* editor hears that someone avoided buying a big-screen monitor because "it takes up too much desk space," the editor's face starts glowing red, and steam shoots out of his ears, just like Yosemite Sam when he gets pissed off at Bugs Bunny. So, once and for all, everyone needs to quit whining about ticky-tack desk space concerns. Screen real-estate is simply too valuable a commodity—it must be begged, borrowed, or stolen by any means necessary, and if buying a larger monitor requires buying a larger desk, so be it.

Trust us when we tell you that 15- and 17-inch monitors are wicked system bottlenecks. First, small screen sizes severely limit the number of open windows you can simultaneously view on your Windows desktop. Shoot, on a 17-inch monitor, you can barely run even a single web browser window at any practical size, let alone multiple windows that don't completely obscure each other.

Second, small screens make it impossible for you to enjoy applications laden with floating menus, such as Adobe *Photoshop* and *Premiere*, and Corel *Painter*. By the time you've arranged all the menus you need, you no longer have any room to view the actual work at hand!

Third—and perhaps most importantly—games are dramatically less impressive when confined to small screens. Indeed, every techie on the *Maximum PC* staff can still remember when he first played *Quake* on a 21-inch monitor. It's a breathtaking experience that mere words can't describe. And if you have any inten-

At 179 square inches of monitor-love, trading up to the 21-inch NEC FP1375X is like going from a twin bed to a California King.



tion of playing a game like *Sim City*—in which viewing wide stretches of city real-estate is directly dependent on how much screen real-estate you own—a large monitor is essential.

At this point, you might be thinking that upgrading from a 17-inch to a 19-inch monitor adds just a mere two inches to your PC lifestyle. Wrong, wrong, wrong! Think square inches, friend. *Square* inches. Submitted for your consideration, the Viewsonic E2 series of displays: The 15-incher boasts 83.7 square inches of viewable screen real-estate, while the 17-incher boasts 109 square inches. But if you spend just a few more dollars on the 19-inch Viewsonic, you get 147 square inches, while the 21-inch model clocks in at 179 square inches.

To wit, compared to the 17-inch monitor, the 19- and 21-inch displays offer 34 and 64 percent more screen real-estate, respectively! And dig this: At about \$250, Viewsonic's 19-inch E290f costs only about \$110 more than the 15-inch E55, and just \$60 more than the 17-inch E75f. (Though, certainly, each monitor in the Viewsonic line-up offers a different degree of pure visual quality, screen real-estate notwithstanding.) Bottom line: Unless you're extremely strapped for cash, you should always opt for the largest monitor possible,

especially considering that you'll probably upgrade your monitor just once every three or four years.

If you don't want to replace your existing small-screen CRT, you can always improve your screen real-estate situation by configuring a multi-monitor setup (see page 60 for details). For example, if you marry a 15-inch LCD to your existing 17-inch CRT, you'll nearly double your screen real-estate (and you probably won't suffer any desk space dilemmas, because LCD flat panels are so thin and dainty). That's right—while a 15-inch LCD offers 108 square inches of screen real-estate, a 17-inch CRT offers only 109 square inches, due to the fact that CRTs can't display pixels across their entire glass area. Just be aware that when you play a game on a dual-monitor setup, it will appear only on your primary display.

Finally, you should be aware of one more potential display bottleneck: Your CRT refresh rate can actually impede your 3D gaming frame rates. So if your CRT monitor can't exceed a refresh rate of 80Hz at 1280x1024, you won't get more than 80fps when running 3D games at that resolution (unless you disable vsync).

Your most urgent upgrade

If you're saddled with a 15- or 17-inch CRT, go out and buy a 19- or 21-incher—*now*. High-quality big-screen displays are probably much less expensive than you think. For example, NEC's 21-inch (and totally kick-ass) FP1375X can be found on Pricewatch.com for as low as \$900. And if all you care about is sheer size, the same web site has links to a great number of 21-inchers that fall in the \$500 range. Think about it: You could buy a new GeForce4 videocard for \$400 and possibly get nothing more than a few extra frame rates, or bust out \$500 for a monitor purchase that can dramatically reinvent your life. The choice is yours.

Sometimes, It's the Little Things

Not all your bottlenecks are tied to motherboard-level silicon. No, some are simply intrinsic to your basic PC lifestyle. So here are some remedies for the nagging little bottlenecks that we rarely even stop to consider.

Programmable Buttons



The bottleneck: Start Menu > Program Files > Internet Explorer. Then go to Favorites, and select Google.com. Sorry, Charlie, you just wasted 90,000 of your own processing cycles. The solution: Just hit the handy programmable Search button on your keyboard.

The Ergonomic Chair

Hunched over like a pack of terminal Yodas, the staff of *Maximum PC* is a living testament that ergonomic chairs aren't just a luxury, but a necessity. Learn from our mistakes—get a comfortable chair designed for extended use.



Quality Cables



If you're using a cheap, crappy Ethernet cable, you're likely to get more errors and less bandwidth than you would with a high-quality cable, especially in high-interference environments near power lines. So don't be a chump—buy quality cables without a second thought.

CD Labeler

You've had your fun—now put away the Sharpie pen and start making decent labels for your CD-Rs. You can list their contents, print legible serial numbers onto the disc itself, and even create uniquely festive ornaments for next year's Christmas tree.



CD Binder



We hate jewel cases. They get lost too easily and threaten to shatter if you just *look* at them. So we tuck new CDs and their booklets into binders from www.caselogic.com. It always pays to have your software library consolidated in one place.

Uninterruptible Power

Someone once said "dirty power corrupts absolutely," or something like that. We agree. An uninterruptible power supply with line conditioning can protect sensitive components from brownouts and surges, as well as giving you a few minutes of "save time" when the lights go out.



A Fridge



When we're working late into the night in the Lab, the last thing we want to do is troll all the way to the supermarket to grab the fresh vegetables and lo-fat primavera dip preferred by the staff. No, a small fridge is the only way to go.

Wireless Optical Mouse

There once was a mouse from Nantucket/Whose cord was so long we could chuck it/Across the room/With a resounding boom/Into the non-wireless bucket



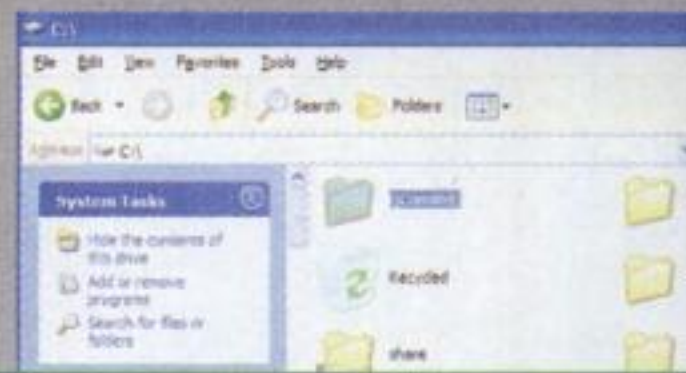
Insert Key A-Bye-Bye



The Insert and Caps Lock keys have special places in our hearts, right next to sexually transmitted diseases and the Taliban. We don't know how these annoying keys got placed so close to useful ones, but once we've yanked them out of our keyboards, another bottleneck goes the way of the dodo.

File System

We're not wild about being told where to put our files (does "My Documents" mean ours, or Microsoft's?). Nonetheless, it makes sense to have all your files centralized where they can be easily backed up, searched, or destroyed when the Senate Judiciary Committee comes a-callin'.



Parabolic Mirror



Who's that looking over your shoulder? Defend yourself from intruders by propping a handy parabolic mirror from www.thinkgeek.com onto the corner of your monitor. You'll never be caught off guard again.

An Intern

Make him move stuff. Get him to pose as you on the phone. Dress him up like Pocahontas and make him dance around the Lab. The fun and productivity never stop when you've got an intern onboard! ■





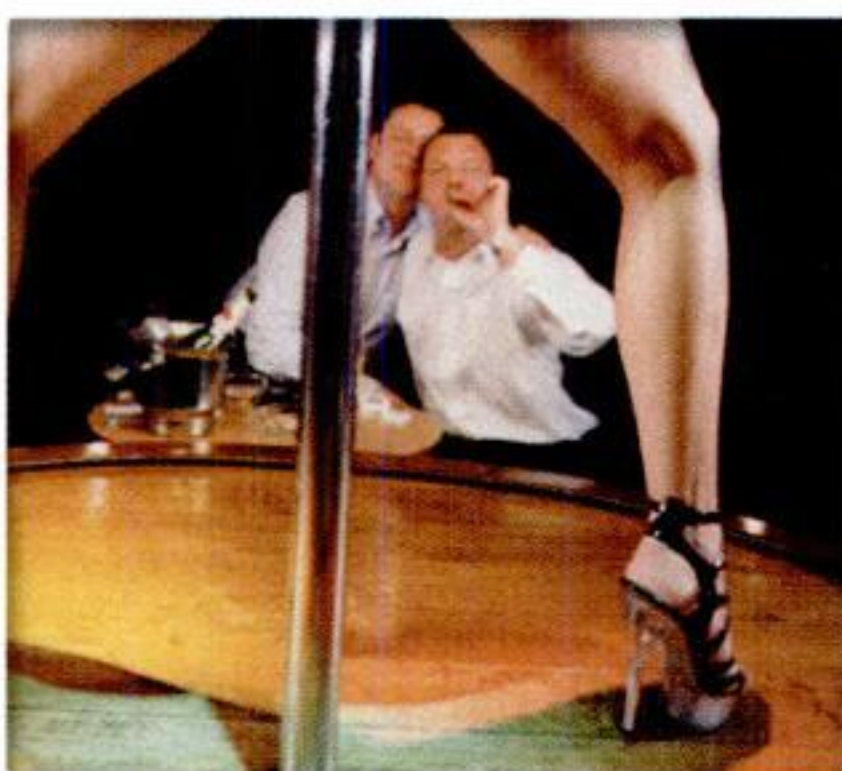
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Scene 2.



Scene 3.



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In **LIVING COLOR**

Today's photo printers deliver hard-copy prints that can reinvent the way you use your digital camera. We review five digital darkrooms and separate the keepers from the outtakes

BY STEPHEN BEALE

Digital cameras have inspired throngs of computer users to post their shots on the web. This much we know—a brief perusal of Tim's "Online Gallery of Things I've Melted With a Blowtorch" will show you just one common use of digital photography. But whether you're shooting pics of your own folk-art masterpieces or capturing photographic proof that Tim lit your hillside on fire, sooner or later you'll want to see your digital images in print. That's what the printer vendors are counting on as they roll out a new generation of output devices dedicated to the art and science of photo reproduction. These babies are *not* designed to compete with multifunction or laser printers. Instead, they're built to crank out high-quality glossies that'll make you forget the term "film camera" once and for all.

We tested the living daylights out of the latest photo printers from Epson, Canon, HP, and Sony. We also tore apart an older printer from Olympus, in lieu of re-reviewing the Olympus P400, which received a 9 verdict in July 2001. The first three manufacturers offer ink-jet models, while Sony and Olympus have placed their stock in dye-sublimation technology.

Dye-sub printers produce photorealistic images by transferring vaporized dyes of cyan, yellow, and magenta from a plastic ribbon to specially formulated paper. Unlike other printing technologies, a dye-sub engine can vary color density for each dot of color, so a dot can be, say, 5 percent cyan, 40 percent yellow, and 30 percent magenta—a light shade of orange. This continuous-tone capability allows the dye-sub printer to mimic what happens in a traditional photo lab.

Most ink-jet printers can't vary color density. Each dot is 100 percent cyan, magenta, yellow, or black (that is, C, M, Y, or K). However, the dots are nearly microscopic, and by arranging them in certain patterns and using a host of other tricks, ink-jet printers can closely simulate the continuous tones of a traditional film photo. Epson and Canon employ six-color printing engines that add a light cyan and light magenta to the basic CMYK colorants. HP

sticks with a four-color process, but uses a proprietary technology known as PhotoREt to simulate continuous tones.

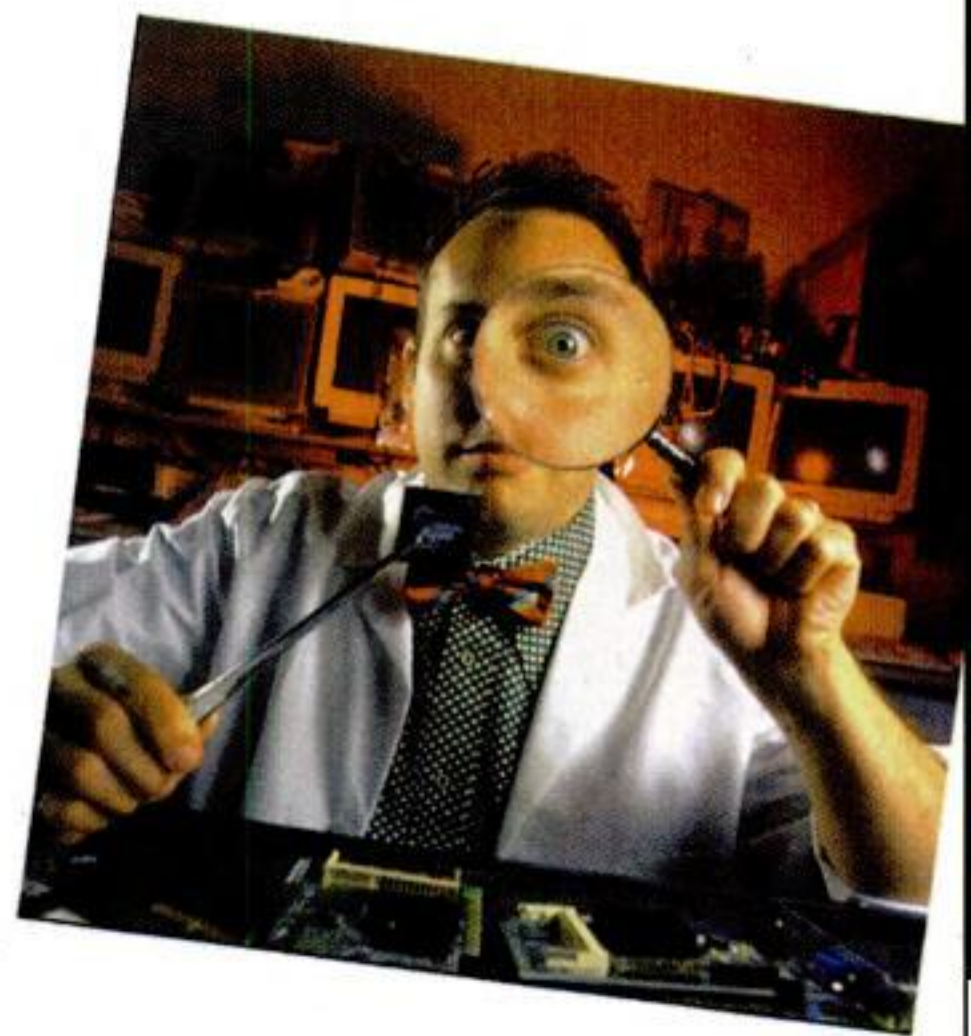
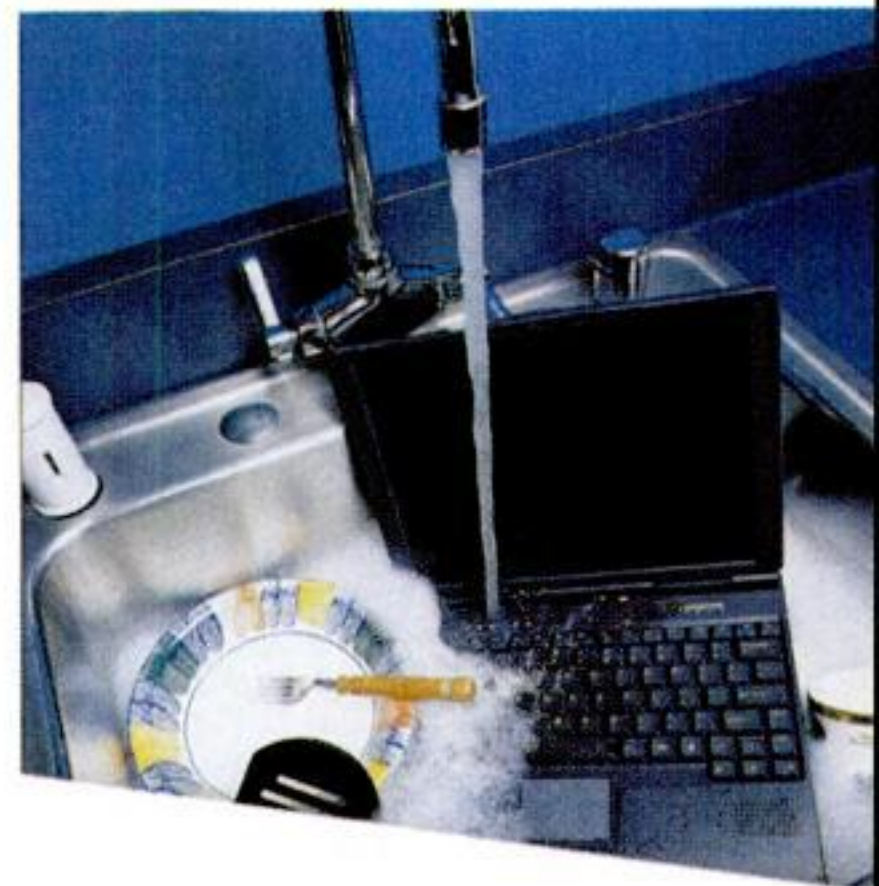
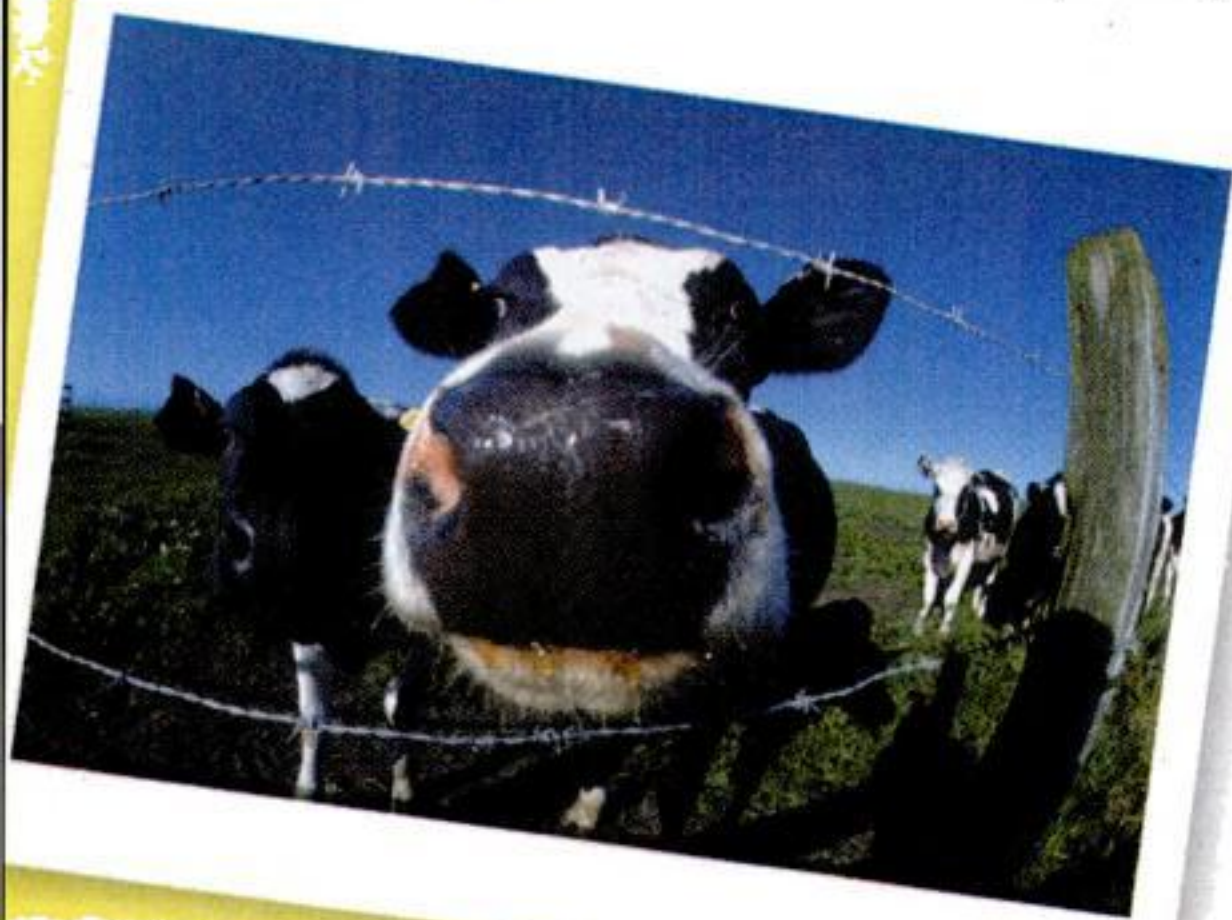
Although they don't offer true continuous-tone output, ink-jet photo printers have their own advantages over dye-sub: They can produce sharper detail, boast faster performance, and print on a wider range of substrates. Some general-purpose ink-jet printers can do a decent job of printing photos, but they're slow and don't match the quality of dedicated photo printers.

During testing for this roundup, we printed scads of digital images on each printer's highest-quality bundled paper, then inspected the prints for photorealism, sharpness, and rendition of highlights and shadows. Many of our test images had subtle details that should have been difficult to reproduce, but except for Sony's DPP-SV77, all of the printers performed admirably. Only a true expert would be able to differentiate their output from what you get at the two-hour photo lab on the corner.

When shopping for a photo printer, it pays to factor in the cost of paper and ink. To get photo-quality output, you'll need expensive, premium-grade photo paper. And keep in mind that manufacturers often overestimate the number of pages you can print from a single ink cartridge. Another issue to consider is durability. Like most film photos, ink-jet and dye-sub prints will fade if exposed to sunlight and airborne contaminants. To promote longevity, manufacturers recommend that you place images under glass or plastic and keep them away from sunlight. And if you want photos that will endure for decades, Epson offers archival printers that use long-lasting pigmented inks instead of the dyes in most ink-jet models. See our paper showdown on page 49 for more info on general paper issues.

Finally, the maxim "garbage in, garbage out" most definitely applies to photo printers. For example, we found that images required a resolution of at least 144dpi to print with sharp detail. So don't expect gallery-quality photos if you're using a one-megapixel camera or downloading 72dpi JPEG files from the web.

And with that, let's begin dissecting the printers...



Epson Stylus Photo 1280

Slow but wonderful output on a wide range of media

Epson's Stylus Photo 1280 demonstrates why specs are nearly meaningless when comparing photo printers. The box touts the product's "2,880dpi" output (actually 2,880x720, if you want to get technical about it), but considering the 1280's laggardly performance at that resolution, you'll feel like it's the year 2880 by the time a photo finally emerges.

The good news is that you'll rarely have to wait for 2,880dpi output, because the 1280 produces great-looking images even at lower resolutions, which print much faster. This Epson is still a slowpoke compared with Canon's S9000, but more than compensates with a great software bundle and its ability to print consistently well on other vendors' paper.

Like Epson's previous photo printers, the Stylus Photo 1280 uses a six-color printing mechanism, adding light cyan and light magenta to the standard CMYK inks. With its wide-carriage, rear-feed design, it can handle an incredible range of print media, from sheet-fed postcard stock to 13x44-inch roll-fed banner paper. The bundle includes rollers that attach to the back of the printer, along with a sample roll of four-inch wide photo paper. Installing paper from the rollers is a little tricky, but once we got it working, we could easily print a panoramic image measuring 4x31 inches.

Even at 720dpi, the 1280 produces attractive photos, and it's particularly adept at reproducing subtle highlight and shadow details. It tends to print with less color saturation than the other models. In some images, colors look just right, but in others, they seem a tad muted. You can always crank up the saturation using the Epson print driver or bundled *Photoshop Elements* software.

With most images you're likely to print, you'll be hard-pressed to tell the difference between the Epson's 720dpi and 1,440dpi output modes. In one of our test photos, details in the model's hair that looked soft at 720dpi sharpened up nicely at 1,440dpi, but that was the exception. This is fortunate, because the printer crawls at higher resolutions. For example, a 4x5 photo that took 1:34 to print at 720dpi slowed to 2:46 at 1,440dpi and a snail-like 7:44



■ The 1280 actually uses a six-color printing process, adding light cyan and light magenta to the CMYK palette.

at 2,880. An 8x10 image printed in 4:28 at 720dpi and 7:21 at 1,440dpi, but required an agonizing 23:19 at the 1280's top resolution. Canon's S9000, by comparison, printed the same 8x10 image in a little more than two minutes at its maximum quality setting. The bottom line: At 720dpi, the Epson 1280 is about as fast as the HP, Olympus, and Sony printers, but slower than the S9000. At higher resolutions, it's a tortoise in a pack of hares.

On the plus side, the 1280 was by far the best at printing on other vendors' photo media. Photos printed on Konica and Pictorico paper looked remarkably consistent with those printed on Epson's own paper. And the Epson was the only printer to do a good job on Pictorico's Glossy Photo Film stock. That said, it also did the worst job of printing photos on plain paper: Low-resolution dot patterns were apparent, and Epson's ink practically soaked the paper.

The 1280 also benefits from some great software. Its print driver interface is logically organized and lets you modify brightness and saturation along with the mix of CMYK colorants. Better still is the bundled Adobe *Photoshop Elements*, a powerful image-editing program that gives you most of the features in the full *Photoshop* package. For example, the software lets you easily print multiple versions of a single photo, each with different saturation or tonal adjustments, to see which one looks best.

The Epson 1280 doesn't quite rate

■ Below is a reproduction of the 1280's highest-quality output. Using a pro-level UMAX 2100XL scanner, we scanned the original print at 100 percent/300dpi, and placed it in this page layout with no color correcting. Unfortunately, the scanning process, as well as the elaborate printing process used in the production of the magazine, degrades the original print's quality. Nonetheless, the other four sample swatches that appear in this article were produced in an identical manner, so comparisons should be telling. This particular swatch demonstrates that the Epson produced somewhat muted, though nonetheless faithful, fleshtones.



SPECS	
PRINT MECHANISM	MICROPIEZO INK-JET
COLORS	SIX (COMES WITH ONE BLACK INK CARTRIDGE AND ONE FIVE-COLOR CARTRIDGE)
MAXIMUM PAPER SIZE	13x44 INCHES
MAXIMUM RESOLUTION	2880x720

Kick Ass status. It's much slower than its main competitor, and some will prefer the more-saturated colors of its rivals to the 1280's slightly muted hues. However, its media-handling flexibility and great bundled software make it the champ of this roundup. And if you're already used to waiting anywhere from two to 24-hours for your photo-lab prints, there's no reason why you can't wait 23 minutes for a 1,440dpi print that's more than suitable for framing.

MAXIMUM PC VERDICT

Stylus Photo 1280
EPSON AMERICA

➕ **SMELLS LIKE ROSES:** Produces good-looking photos on a wide range of media, including tabloid stocks and paper from other vendors. You also get a great image-editing program in *Photoshop Elements*.

➖ **WHO CUT THE CHEESE?:** It's painfully slow at 2,880dpi resolution.

www.epson.com

\$500

9

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Canon S9000

Six-color speedster is partial to Canon media

If there were a Daytona 500 of photo printers, Canon's new S9000 would be running laps around its competitors. Depending on how you're counting, it's two-to-four times faster than its main rival, Epson's Stylus Photo 1280. With a six-color ink-jet printing mechanism, the S9000 also produces great-looking photos—as long as you're willing to stick with Canon's own paper. Unfortunately, it did a lousy job printing on non-Canon paper, and the bundled software will appeal primarily to the grandmothers of the world, unless you're fond of adorning your images with syrupy frames and borders that really belong in a Hallmark Cards bargain bin.

Capable of printing photos up to 13x9-inches, the S9000 competes head-to-head with the Stylus Photo 1280. It has a similar wide-carriage design that can handle an assortment of paper, including 4x6-inch, letter-size, and tabloid-size. Paper feeds in through the back and travels a slightly curved path to the front output bin. The Canon, however, lacks the Epson's ability to print on roll-fed paper.

When printing on Canon's own premium photo paper, the S9000 did a great job. Photos printed with sharp detail and rich colors that were more saturated than those produced on the Epson printer. And the Canon's speed was truly impressive: At its highest quality setting, it printed our 4x5 test image in 43 seconds, and our 8x10 image in 2:05—each about twice the speed of Epson's printer in the latter's 720dpi photo mode.

However, the S9000's six-color bubble-jet process appears to be highly dependent on Canon's photo-quality paper stocks. When printed on the Konica and Pictorico paper, images consistently came out with a yellow or green cast. This was most apparent when we printed a grayscale image that had been converted to the RGB color space. Instead of printing shades of gray, the S9000 printed shades of dark green. ACK!

Although you'll want to use premium photo paper to take full advantage of the printer's capabilities, the S9000 does print reasonably well on plain paper and Canon's lower-grade ink-jet paper. Images on plain paper looked sharper and more photorealistic than those printed with the Epson 1280,



■ The S9000 is extremely fast, but tends to print with a green cast when working with non-Canon papers.

though many printed with the same yellow-green cast we saw on the non-Canon photo paper.

Canon's Windows XP printer driver lets you modify the amount of ink printed for each color channel, as well as overall brightness and color saturation. Using these controls, we found we could reduce—but not eliminate—the printer's color cast on non-Canon paper. Canon's driver also lets you add labels, background patterns, and special effects such as a sepia-tone filter.

The bundled software is another story: It stinks. Canon's *ZoomBrowser EX* lets you view and organize images, while *PhotoRecord* lets you print "photo albums" consisting of single or multiple images. But Canon doesn't include an image-editor, even a bare-bones one, though you can create panoramic images with the bundled *PhotoStitch* software. We must also note that *PhotoRecord*, the recommended printing application, will print your image with a hokey-looking frame and border that are not only ugly, but also eat up ink. You can turn these off, but only after navigating through multiple panels and an annoying "How to Print" wizard.

On the plus side, Canon gets kudos for deploying its color inks in separate cartridges, rather than in a single container, which is what you'll find in the Epson and HP printers. Canon's approach can potentially reduce consumable costs, because you can replace individual colors as they run out rather than an entire three- or five-color cartridge. However, you have to pay attention when installing

SPECS	
PRINT MECHANISM	THERMAL INK-JET
COLORS	SIX (COMES WITH ONE CARTRIDGE FOR EACH COLOR)
MAXIMUM PAPER SIZE	13x19 INCHES
MAXIMUM RESOLUTION	2400x1200

the cartridges: The slots are clearly labeled for each color, but they aren't keyed to prevent you from accidentally swapping, say, cyan for magenta, and thus turning your images into a gallery of bad acid trips.

If you place a high priority on speed, want the flexibility of printing on large-size media, and don't mind buying all of your paper from Canon, this is probably the photo printer for you. But set aside a few bucks for a real image-editing program like *Photoshop*, because you'll want to ditch the software that's bundled with the S9000.

MAXIMUM PC VERDICT

S9000
CANON USA

➤ **STEP RIGHT UP:** Easily the fastest printer in the roundup. Prints great-looking photos—as long as you stick with Canon-branded media.

➤ **SIT BACK DOWN:** Images printed on other vendors' paper showed a noticeable color cast. The bundled software blows.

www.canon.com

\$500

8

■ The Canon S9000's highest-quality color output is slightly more saturated than the Epson's, but both printers do an excellent job with highlight and shadow details.



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Hewlett-Packard PhotoSmart 1315

Four-color gadfly gets the job done

When it comes to photo printing, HP plays the unlikely role of gadfly. Canon and Epson would have you believe that you need special six-color inks to print good-looking images, yet the PhotoSmart 1315 does a remarkable job with the same four-color inks deployed in HP's general-purpose DeskJet models. The printer is also reasonably fast and can produce images directly from digital camera media, if that's what floats your canoe. Unfortunately, the PhotoSmart 1315 lacks its rivals' ability to print on tabloid-size media and has trouble handling some non-HP paper stocks.

Following the same basic design used in the DeskJet, HP's engineers placed the PhotoSmart's input and output trays in front, so the paper goes in upside-down and makes a U-turn as it's printed. This allows for a compact footprint, but also limits the printer's ability to work with the heavier stocks that the Epson printer handles with ease. For example, the HP added thin but noticeable scratches when printing on Konica's 11.8-mil photo glossy stock. And on AGA's thin but high-quality glossy photo film, the HP printed with a noticeable color cast. However, as you might expect, the printer had no problems with HP's own bundled photo paper.

On the plus side, the PhotoSmart's double-decker input bin can simultaneously accommodate postcard-size media in its upper tray and larger stock on the bottom. This is convenient if you want to print on both types of media, but the design makes it difficult to properly align small stocks in the lower tray. And instead of using the print driver to select between the upper and lower input trays, you manually engage the former by pushing it toward the paper feeder. That said, the PhotoSmart is unique in its ability to automatically sense the paper you're using, then adjust its print settings accordingly. We found that the printer's optical sensor could distinguish between plain paper and higher-quality ink-jet paper, but adds about 10 seconds to print times as it scans the type of paper you've inserted.

More useful than automatic paper-



■ The 1315's small LCD monitor is a useful tool when printing digital images directly from flash memory cards.

sensing are the built-in slots for popular camera media: Memory Sticks, CompactFlash, SmartMedia, and even IBM's MicroDrive. Once you've inserted a card, you can use the LCD screen and navigation buttons on the printer's front panel to view, arrange, and print images. The LCD also provides useful feedback when you're printing from a PC.

The PhotoSmart was reasonably fast, producing a 4x5-inch image in 1:40—about the same as the Epson printer in 720dpi mode, though not nearly as speedy as Canon's S9000. An 8x10 image printed in 4:22—again, about as fast as the Photo Stylus 1280, but about half the speed of the Canon. In some images, we could see minute dot patterns if we looked closely, but on the whole, we were impressed by the PhotoSmart's image quality.

Unfortunately, HP's printing software lags behind the drivers from Canon and Epson. Though you can modify saturation and brightness, you can't change the mix of CMYK colorants, except through a slider control that lets you choose between emphasizing "warmer" or "cooler" colors. Worse yet, the driver doesn't let you save custom settings. The bundled software, ArcSoft's *PhotoImpression*, offers basic image-editing tools, but nowhere near the level of image control provided by *Photoshop Elements*.

SPECS

PRINT MECHANISM	THERMAL INK-JET
COLORS	FOUR (COMES WITH ONE BLACK INK CARTRIDGE AND ONE THREE-COLOR CARTRIDGE)
MAXIMUM PAPER SIZE	8.5x14 INCHES
MAXIMUM RESOLUTION	2400x1200

For a PC printer that can also print directly from digital camera media, the PhotoSmart trumps Sony's DPP-SV77, despite the Sony's dye-sub printing technology. But for better paper handling and image quality, you should throw down for the Canon or Epson.

MAXIMUM PC VERDICT

PhotoSmart 1315
HEWLETT-PACKARD

LOUIS ROEDERER CRISTAL BRUT '95:

The PhotoSmart 1315 prints good-looking photos at a reasonable speed. You can load postcard and letter-size stocks simultaneously in the dual input bin.

BARTLES & JAYMES HUCKLEBERRY COOLER:

The printer has trouble handling other vendors' heavy photo stocks and glossy photo film, and it can't produce tabloid-size output.

www.hp.com
\$400

7

■ When printing on HP's bundled paper, the 1315 offered warm colors and generally very good print quality, as seen here. But the printer didn't exhibit the same image quality with non-bundled paper.



Olympus P-330N

Aging dye-sub still makes great-looking snapshots

At first glance, this dye-sublimation snapshot printer from Olympus seems to belong in a digital-imaging museum, despite its decidedly high-tech look. Originally released in 1999 as the P-330, it lacks a USB interface, and it almost missed this roundup because the driver software didn't support Windows XP. However, after we queried Olympus tech support about the printer's OS compatibility, a helpful rep e-mailed us a beta version of an XP driver, and we're glad he did, because despite its age, the P-330N kicks butt compared with Sony's DPP-SV77, the other dye-sub printer in our roundup.

Olympus bills the P-330N as a "home photo printer" instead of a PC peripheral, and indeed, there's much you can do with it even if there's no computer in sight. With RCA and S-video inputs, it can print images from a TV, camcorder, or other video device, and a built-in SmartMedia slot lets you print directly from digital cameras that use those cards. It lacks a built-in display, but you can use an RCA video output to preview images on a TV set. Controls on the front panel let you choose such printing options as four-up printing and adding a date stamp.

But of course, we were most interested in using the P-330N with a PC to print high-res digital images, and this is where it outclassed the Sony printer. Although it's limited to a maximum paper size of 4x5 inches—and the image itself can be no bigger than 3.5x4.5 inches—snapshots produced by the P-330N came the closest to replicating the traditional prints you'll get from a photo lab. This is partly because of the paper media, which boasts a smooth glossy overcoat and feels like traditional photo paper. But the images themselves also looked great, with colors that appear much more natural than those printed on Sony's dye-sub model. However, as a testament to the ever-increasing quality of ink-jet technology, some of the prints generated by the P-330N at its maximum 306dpi resolution lacked the sharp detail of those produced by the Canon, Epson, and HP models.

Despite its reliance on a parallel



■ We like the P-330N's output—but unfortunately your final prints will be limited to just 3.5x4.5-inches.

connection instead of USB, the P-330N's print speeds are comparable to those of most other models reviewed here. We printed a 4x5-inch snapshot in 1:43, about two seconds slower than the Sony. Only Canon's S9000 was appreciably faster. The Olympus's WinXP print driver—in beta stage when we performed our testing—doesn't include all the bells and whistles of the Epson or Canon drivers, but it does let you control saturation, sharpness, and the overall balance of cyan, magenta, and yellow dyes. The driver is also far superior to what Sony offers with the DPP-SV77.

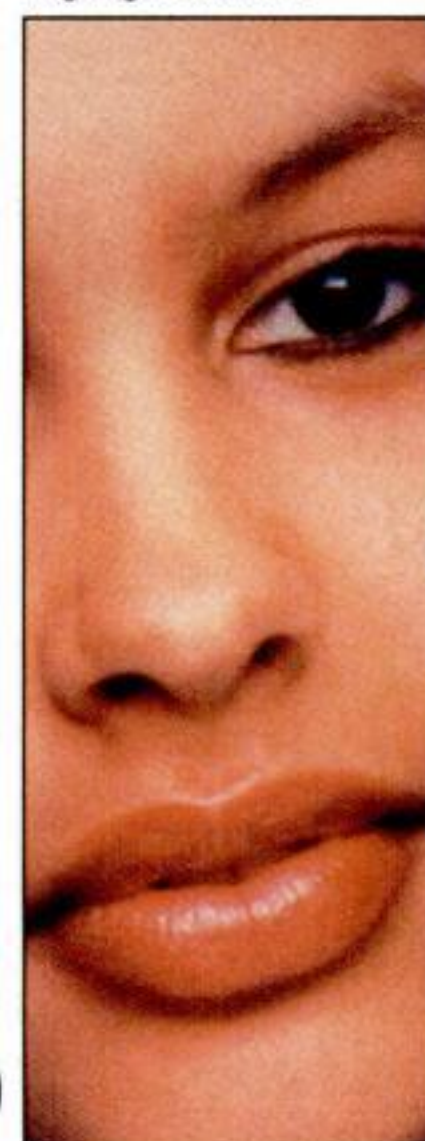
Olympus sells P-330N consumables in packages that include 60 sheets of paper and a corresponding dye-sub cartridge. In addition to standard paper, you can buy adhesive-backed paper in single-sheet or 16-cut varieties, and you can also choose between a three-pass CMY ribbon and a four-pass ribbon that adds a protective overcoat. The bundle we reviewed included a "starter pack" with enough paper and ribbon for just 10 prints.

The P-330N's biggest drawback is that it can't produce large prints. In fact, it's the smallest-format printer in the roundup. But if you're the kind of photographer who doesn't mind thinking small, and you want all the fancy, "I don't need a stinking PC"

SPECS	
PRINT MECHANISM	DYE-SUBLIMATION
COLORS	THREE, OR THREE PLUS OVERCOAT
MAXIMUM PAPER SIZE	4x5 INCHES
MAXIMUM RESOLUTION	306DPI

options we discussed above, the P-330N is certainly worth a look. If you want dye-sub output in mungo-size 7.5x10 prints, you might consider the Olympus P-400, which received a 9 verdict in our July 2001 issue. The P-400 costs about \$700, so it's quite an investment for image quality that's arguably no better than what you'll get from a really good ink-jet. And ink jets, if you'll remember, can also be used to print text pages in a pinch.

■ Though it uses a dye-sub process to mimic the continuous-tone look of real film, the P-330N still falls a bit short when it comes to subtle shadow and highlight details.



MAXIMUM PC VERDICT

P-330N
OLYMPUS AMERICA

➕ **HUNKY-DORY:** The P330N produces snapshots that look great and closely resemble photo lab prints.

➖ **FUNKY-MONKEY:** There's no USB connection, and image size is limited to a paltry 3.5x4.5 inches.

www.olympus.com

\$400

7

Sony DPP-SV77

Lousy photos send this dye-sub to the doghouse

If the P-330N belongs in a museum, the DPP-SV77 is more like something that Sony's Aibo robot might have deposited on the living room rug. Although it boasts a 403dpi dye-sub engine, the DPP-SV77 produced some of the worst-looking prints in our roundup. Images were oversaturated, often with a noticeable color cast, and subtle highlight and shadow details were consistently lost in masses of pure white or black. Even the supposedly "inferior" ink-jet printers did a much better job.

Mind you, the Sony's prints certainly looked photorealistic—it's not as if they were wrecked by dithering or aliasing, or anything like that. And they had nearly the same sleek feel as those produced by the P-330N. But, on the whole, the DPP-SV77 thoroughly belied the conventional wisdom that dye-sub printers are automatically superior to ink-jets.

As with Olympus's P-330N, the DPP-SV77 prints each of its three colors in a separate pass, and you can actually see the paper moving back and forth, peeking out from each side, as the CMY dyes are laid in. Unfortunately, the Sony doesn't peek quietly. We didn't measure decibels, but we can say that the printer's screeching came uncomfortably close to fingernails-on-a-blackboard territory. During testing, a 4x5-inch image printed in 1:41. This is in the same ballpark as most of the other printers, but the grinding of the dye-sub print engine made print times seem longer.

In Sony's defense, the DPP-SV77 does outshine the P-330N when it comes to print size. The bundled postcard media, with perforated tabs at each end, lets you create borderless 4x6-inch photos, whereas the Olympus is limited to 3.5x4.5. And being a gadget of the new millennium, the DPP-SV77 includes a USB connection, in contrast to the P-330N's creaky parallel interface.

On the other hand, Sony's printer software is downright primitive. Aside from choosing between portrait or landscape orientation, there's little you can do to control printed output. However, we did get better results when we selected "Printer Color Management" in the



■ As a physical presence, the DPP-SV77 looks high-tech and lustworthy. Sadly, its print quality doesn't match Sony's historically high pedigree.

Windows print dialog.

Like some of its rivals, Sony engages in questionable specsmanish in its packaging, billing the DPP-SV77 as a "3.8-megapixel" output device. While that's technically correct, it's a much less impressive spec in a printer than in a digital camera, where 3.8-megapixel resolution would be something to crow about. And let's make no bones about it: The DPP-SV77 is clearly aimed more at gadget freaks than PC users. You can print directly from Sony's Memory Stick media, SmartMedia, or CompactFlash cards, though you'll need a PC Card adapter (not included in the bundle) to use the latter two options.

With a built-in 3.2-inch LCD screen and supplied stylus, you can also preview images, apply special effects, add text and graphic elements, and even print your image in a calendar. We like these features, and if they could be done well on the cheap, we'd love to see them integrated into all photo printers. But unlike Olympus's P-330N, the DPP-SV77 lacks a video-in connection, so you can't print images from a TV or camcorder.

As a PC peripheral, the Sony falls woefully short of the mark. It's the one model in the roundup that we absolutely would not recommend, especially considering its \$500 price tag, and thus it receives a lowly 4 verdict. This judgement might seem unduly harsh to current DPP-SV77

■ Compared with the Epson swatch on page 42, this Sony swatch lacks color accuracy as well as a lot of highlight and shadowing detail. That said, this swatch here actually shows the Sony in a pretty generous light. Other Sony prints displayed heinous detail dropouts and pronounced oversaturation.



SPECS	
PRINT MECHANISM	DYE-SUBLIMATION
COLORS	THREE
MAXIMUM PAPER SIZE	4x6 INCHES
MAXIMUM RESOLUTION	403DPI

owners who are more or less happy with their prints. But when a photo printer hobbles in fourth in a four-printer race, we have to make our opinion resoundingly clear. Maybe Sony should just ditch dye-sublimation technology entirely, and move on to ink-jet. If the best printers in this roundup are any indication, there's no reason to go dye-sub when cheaper, more versatile, options are ready and waiting.

MAXIMUM PC VERDICT

DPP-SV77
SONY AMERICA

⊕ **USDA PRIME:** This dye-sub printer can produce borderless postcards up to 4x6 inches.

⊖ **AUNT SALLY'S RUMP ROAST:** The DPP-SV77 produced the worst-looking images in the roundup, and it's obnoxiously noisy to boot.

www.sony.com
\$500

4

The Power of Pertinent Paper

If you want the best prints, you have to pick the right paper

Photo printers employ lots of fancy technology to produce realistic images, but one of the most important factors behind good photo quality is as old as civilization itself: paper.

That's right: The paper you print on can dramatically affect final print quality.

Each printer manufacturer offers photo paper in varying sizes, weights, and styles, and in some cases, the paper is "tuned" to work best with the manufacturer's own printers. Additionally, several dedicated paper vendors offer paper stock for use in other companies' ink-jet printers. We tested ink-jet papers from Konica and AGA Chemicals, which sells its media under the Pictorico brand. We didn't test dye-sub paper, because you'll always get the best results from the replacement paper that's sold for your specific dye-sub printer.

Paper is one of the most profitable segments in the digital imaging market, so Epson, Canon, and HP naturally want you to stick with their own brands. This is pretty much a necessity if you use Canon's S9000, because it printed with a noticeable color cast on the non-Canon paper we tested. HP's PhotoSmart 1315 also demonstrated a strong preference for HP media, though it produced decent-looking images on some of the third-party stocks.

Epson's Stylus Photo 1280 didn't seem to care which company's paper it used. Although there were subtle differences in brightness and color, images printed on the third-party paper were remarkably consistent with those printed on Epson's own media. Because it's more amenable to other vendors' stocks, we used the Epson 1280 for most of our paper tests.

We were most impressed by Konica's Pro and Premium Photo Glossy papers. Their surfaces are noticeably brighter and smoother than Epson's own paper, and they feel more like traditional photo media. Konica's 11.8-mil Pro Photo Glossy, available in packs of 10, is the thicker and heavier of the two. The Epson printer handled it well, but the PhotoSmart 1315, with its U-shaped paper path, seemed to have problems with it. It screeched uncharacteristically as it printed, and while the image itself looked fine, we could see thin scratches on the paper's surface. The PhotoSmart had similar problems with Konica's thinner, 10.4-mil Premium Photo Glossy paper, which is sold in packs of 15.

Konica also offers Photo Silky paper, which features a more textured finish, as well as a glossy adhesive-backed paper.

We were generally less impressed by the Pictorico paper. The Premium Photo Glossy paper actually has a slightly textured finish similar to Konica's Photo Silky stock. It's not quite as bright as Konica's glossy stock and doesn't have the latter's hefty feel. It also tended to curl after coming out of the printer. However, images printed on the paper looked good.

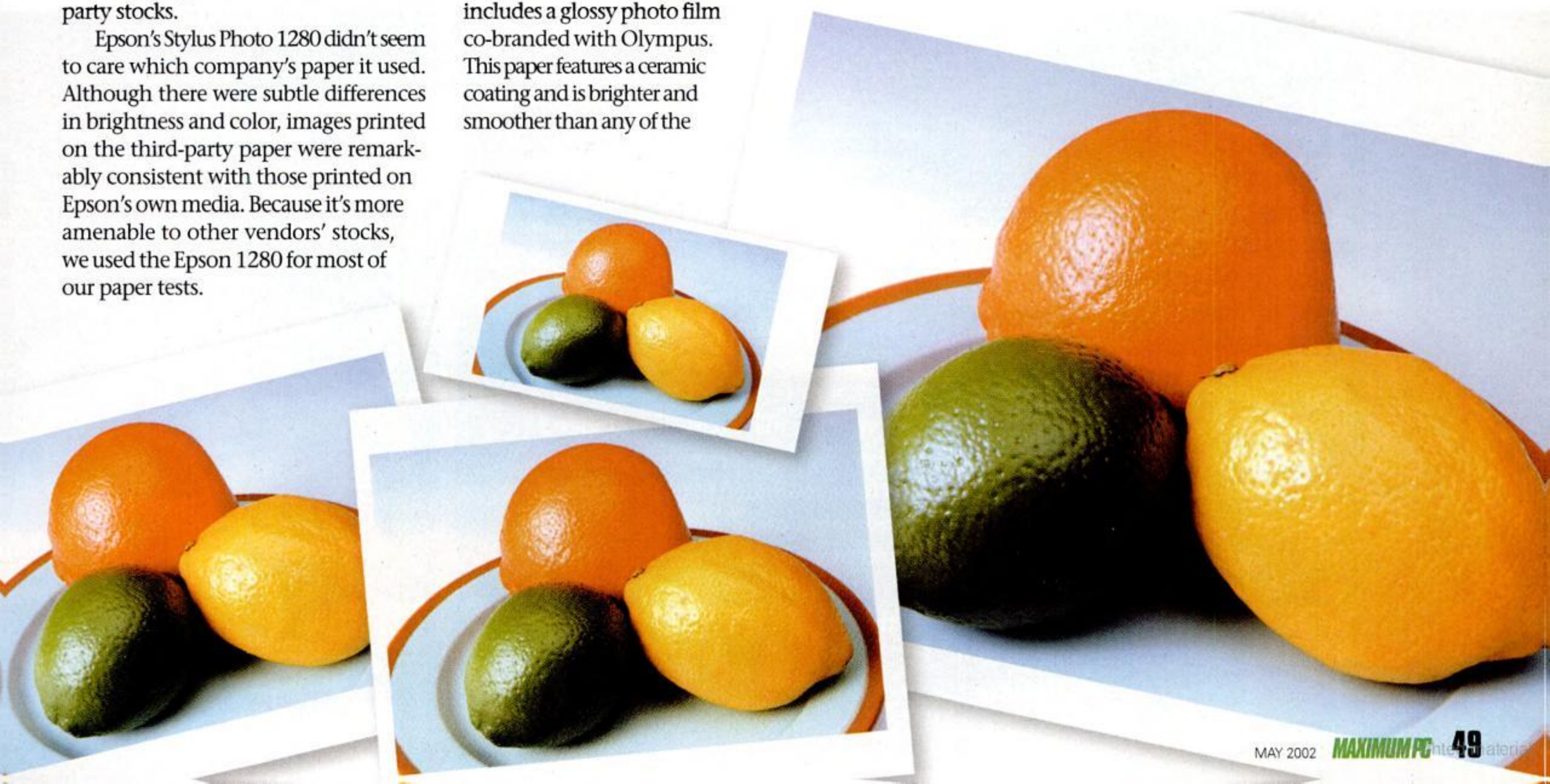
The Pictorico line also includes a glossy photo film co-branded with Olympus. This paper features a ceramic coating and is brighter and smoother than any of the



glossy paper stocks we tested. Again, we got excellent results in Epson's printer. However, HP's PhotoSmart had problems. HP's driver lacks an option for printing on photo film, and when we followed AGA's instructions to choose glossy photo paper, we got an image with a serious color cast.

One of the most interesting "papers" in the Pictorico line is its Premium Poly Silk Fabric. After you print, you peel off a paper backing to get a thin, silky piece of cloth with a photo on it. It looks cool, but it's not washable, so you can forget about making any permanent fashion statements. The vendor recommends its use only in printers with straight-through media paths, so we didn't try it with the PhotoSmart. However, the Epson printer, true to form, handled the fabric paper with ease. ■

■ Here's just a glimpse at all the different paper sizes at your disposal. All of the shots below were printed on the Canon, and show just how colorful citrus fruit can be. From left to right: Konica's 8.5x11 Photo Quality Silky Ink Jet; Pictorico's 8.5x11 Premium Water Color; Canon's 4x6 Glossy Photo Card; and Canon's breathtaking 13x19 A3+ Photo Paper Pro. Look above to see how the Water Color paper actually imparts texture on the final print!



Don't get caught in

DSL Hell

20 burning questions to ask your DSL service provider before you sign up

So you're ready to take the broadband plunge. You want to download realtime video, you want to play cutting-edge multiplayer games, and you want to be able to surf the net without growing old waiting for pages to appear on the screen. In other words, you want the real Internet experience that only broadband can provide.

If DSL is available in your area, every service provider within earshot is probably jockeying for your attention, bragging about its low rates, quick installs, and great service. But as soon as you sign on the dotted line, the budding friendship can turn

very cold. Your new pals don't return your support calls, and they seem uninterested in your installation problems. *They almost seem like different people.*

Don't get stuck in a contract with a service provider that's not right for you. Here are 20 questions to ask a potential provider *before* committing to its contract. Depending on what kind of services you want and how you intend to use your broadband connection, every single one could be a make-or-break deal.

Because, as they say, the devil's in the details.

—JUSTIN BEECH



**1**

Is there anything that could prevent me from getting DSL service, other than my distance from your central office?

The first thing a rep will confirm during the ordering process is whether you're close enough to the central office to receive DSL. But there are other hurdles that might prevent an installation, and an eager sales rep working on commission may not be so quick to reveal them. For example, you might be behind a digital loop carrier (DLC) that isn't compatible with DSL signals (see the glossary at the end of this article for all the obscure DSL terms that we've bolded). Ask about this when you make the call. Or you might have a phone-connected home alarm system that requires a workaround from a technician making a house call. And even if the service provider confirms your eligibility, the "self-installation" packages offered by many DSL service providers might guarantee service only to the switching box in your home—so if your ancient internal house wiring suffers too much line noise, or if you don't have a phone jack in the room you want to receive service in, you may end up having to sign up with a service provider that can complete the installation for you.

2

How long from the time I place my order can I expect to be using my DSL service?

It's rare for any DSL install to be completed within seven days. Most installations take a minimum of two weeks. The majority of this time is spent waiting for the cross-connect to be done at the local telephone company's central office. Once the connect is done, your DSL modem should be able to synchronize with the **DSLAM**, usually indicated by a green "sync" light on your DSL modem. Then you may be online right away, or you may have to wait a little longer for the ISP to enable the line so you can reach the net.

3

Do you make the subscriber agreement available online? If not, how can I review it before signing up?

Signing up for DSL service isn't like subscribing to a newspaper. No, you'll actually be signing a contract between you and your service provider. These contracts detail the conditions under which either side may terminate the contract. Unless you plan to skip the country in the event of a problem, it's absolutely necessary that you read these contracts in advance! For example, if you end up having to move, you may find out that early termination of your two-year contract involves a hefty penalty. In addition, an aggressive contract that makes no guarantees and disclaims any responsibility on behalf of the service provider might reveal an ISP that's not going to be easy to deal with in the event of a dispute.

4

What is the total monthly fee, including all taxes?

While most ISP bills don't have the long list of obscure fees that can be found on the typical phone bill, don't be surprised if your ISP neglects to mention that it adds a **USF** charge. In a few territories, an ISP may

assume that you already know you also have to pay a charge to the phone company for the basic DSL service. In this case, pricing is split into two fees—there's the ISP's charge, then there's the phone company's charge. If you're offered a promotion that discounts the first three months of service, do the math over the entire contracted time (usually a year, at least) before concluding that the deal is worth it, and pay special attention to the early termination fines and fees.

5

What city would be my point-of-presence for your service?

The further away you are from your ISP's POP, the longer your packets must travel to get to and from the Internet, and thus, the higher the latency your connection will have. In fact, after poor bandwidth, poor latency (also known as ping time) is the typical DSL consumer's most common complaint. So if you have more than one DSL provider available to you, the one with the closer POP will likely deliver faster ping times. You should also ask gamers who use the service you're considering about their ping times, which might be an indication of what you yourself will experience. Regardless, if low latency means the world to you, you should seek out an ISP that offers a money-back guarantee within a week or two of signing up.

6

Do I have to pay an initial setup fee? Does it include all necessary equipment?

Setup and installation fees are not uncommon, but *never pay in advance for DSL service*. A professional ISP won't charge you until the installation is complete and working. You don't want to be stuck attempting to deal with an unmotivated ISP refund department in the unfortunate event that your install does not work out. More

than one company has absconded with cash that was paid in advance for services never delivered. We also strongly discourage you from paying for a year's service in advance. A smaller ISP may not be around in six months to deliver on its promises. Also, ask your service provider if it's going to foist a USB modem on you—they are far less flexible when it comes to networking your home. Ideally, you should aim for an external DSL modem with an Ethernet port. You should also ask whether modem failure during the first year is repaired by the service provider. Although modems are frequently provided for free, they aren't cheap for the people who have to buy them.

7

Do you guarantee a minimum throughput? Do you have an online method of testing my speed?

Your service provider should cite maximum upload and download speeds for your DSL. But these speeds are very optimistic, and they don't include overhead that's inherent in TCP packet transfers, so your actual data transfer speed will be at least 10 percent slower than that. Because most residential DSL service providers won't guarantee minimum speeds, an online tool for do-it-yourself speed verification could come in handy if you think you're not getting the speeds you should. Reporting these figure

to your ISP's support staff may help accelerate efforts to have problems looked into. Business-oriented DSL service providers are far more likely to guarantee throughput—for a lot more money.

8

Will I get a static IP? Do you use PPPoE or DHCP?

A **static IP** is the best option if your service provider offers it. Next comes **DHCP**, then finally **PPPoE**. A static IP address gives you more options to run basic home services—perhaps a small web server, or a remote access server so that you can reach your home from other places. A dynamic address (DHCP), as the name implies, can change frequently, making your current location on the net harder to reach from outside. We dislike PPPoE because it is slightly less efficient and requires a "logon" before your line becomes active. With PPPoE, the ISP may also log you off after a period of inactivity. Some providers may offer an upgrade from DHCP or PPPoE to a static IP, but at an additional cost.

9

May I share my connection through my home network? Is there a limit to the number of PCs I can connect to my DSL service? Will I receive any technical support for networking?

Sooner or later you're going to want to share your broadband connection with other PCs in your house. And you may get a rude shock when contacting your service provider's tech support with a problem, only to find out that not only do they not support home networking, they don't even allow it. You can of course play "hide the router" every time you need help from your ISP, but you may prefer to deal with an ISP who understands some of the popular home network solutions and can cope without blaming every problem you might have on your networking gear.

10

Do you provide Usenet (news-group) access? Full or partial feed?

Many DSL ISPs are cutting back on newsfeeds because of the expense of providing a full range of newsgroups efficiently. If surfing Usenet gets your rocks off, verify how complete an ISP's Usenet feed is before discovering later that alt.sweets.skittles.addiction isn't available. A complete list of Usenet groups isn't normally provided within the product pages of an ISP, so speaking to a sales or technical person, or other users of that ISP, is necessary. In the event that your ISP choices are limited and Usenet access is nonexistent, you always have the option of subscribing to a dedicated Usenet provider that you can access through your broadband connection.



1) ISP local point-of-presence (POP): At the POP, the ISP aggregates all subscriber packets and directs them to the Internet. Your ISP enables or disables service from here, and allocates your public IP address as well.



2) Telco inter-CO network: Your ISP is connected to a telephone company's central-office network, which hopefully takes a fairly direct and uncongested route to/from your local central office. Your packets must travel through this CO, along with all your neighbors' DSL traffic, and phone traffic as well.

11

How many e-mail addresses will I receive? Do you offer any spam-blocking services?

Simple questions, rarely asked. Do you have to contact tech support every time you want to change or add an e-mail address or alias? Can you access your e-mail from the web if you're traveling? Does your ISP make any attempt to block spam? You may also want to ask if your account includes space for a personal web page. This can be an attractive option if you don't want visitors to suffer surprise attacks from the pop-ups associated with free web page hosting.

12

Does the provider own its own DSL lines, or is it leasing them from another company?

Be sure to check which business concerns will be involved with the installation and provision of your service. This is a process that can involve up to three companies: the ISP, the DSL carrier, and the telephone company. And every time another company gets involved, that adds another layer of bureaucracy that you might have to wade through when investigating problems.

13

Are there any usage limits on my service?

Like it or not, all service providers have limits on usage, although they may prefer not to talk about them. Do they have fixed download limits per month, or do they prefer to just finger-wag at the top 1 percent of users? Will they warn you of overuse or just cut off your service? Review the contract to find out if it addresses bandwidth consumption. Do not rely on what the rep tells you—read the fine print!

14

Do you offer a free 56k dialup account in case of a DSL outage? How about an 800 number for access when I'm away from home?

Shocking as it seems, we're not completely dialup-free yet, because DSL isn't always 24/7. What kind of dialup system does the

15

What is your refund policy if my service isn't accessible for a full day?

When your service tanks at a crucial moment, it can be very irritating to find out that the ISP will credit you for only 1/30th of the monthly fee. Adding insult to injury, you often have to request your refund each day as well, by contacting customer service (and waiting God knows how long for a rep). If your line has problems, or is out for an extended period, you should expect a full month refunded with no hassles.

16

Do you host game servers or other user-community services? Do you have an active online community and provide any internal newsgroups for discussion of customer issues?

4) Copper pair: A twisted pair of wires carries your phone and ADSL signal under or over ground to your house. ADSL is designed to run only on copper pairs.

3) Central office DSLAM: The DSL access multiplexor is an expensive beast that divvies up a fiber or high-speed data line into hundreds of copper pairs, which are then cross-connected to the telephone wiring panels of the homes in the area.

5) Home, sweet home. Either a splitter or a filter handles the job of directing the phone signal and the ADSL signal to the correct devices.

If your service provider hosts its own game servers, your ping times are going to plummet and life will be good. If it also offers internal newsgroups, these can be the best places to get help or discuss ISP-related issues. You should also do a little basic research on the web (such as at www.broadbandreports.com) before signing up with an ISP in case there is an angry user community out there with legitimate gripes. Beware of any anti-ISP rants written a year or more ago, however; even three months is a lifetime on the net.

17

Does the user agreement give you the right to monitor my e-mail or online activity?

Ask for a link to the service provider's privacy policy, and don't hesitate to get heavy with the rep and ask if they monitor traffic and sniff packets for any reason—whether for the government or anyone else. Do not support ISPs that don't have a clear anti-spam policy!

18

Can I check your network status online 24 hours a day?

An ISP that has a decent set of customized information online—such as information about network outages and warnings about service interruptions during routine maintenance—will save you a lot of time waiting on hold for customer reps. It also suggests that it's a 21st century company that understands the web and knows how to operate efficiently.

19

Is there a secure account control center for me online?

What kinds of services can I access through this page?

You don't want to have to call customer service every time you want to change your e-mail settings or swap your password. A good service provider will let you tweak your settings through the web.

20

Do you offer 24/7 customer support? What are the average wait times? Who's going to be helping me?

Twenty-four-hour/everyday tech support ought to be standard, but be aware that the person answering the phone on a Sunday morning may be able to do no more than open a service ticket, which will then be handled by a "real" tech on Monday morning. A national service provider is more likely to have effective 24/7 support than a local one, but a local ISP may also address serious problems much faster than a national ISP. And a local tech support rep is also likely to be more accountable—and thus more motivated to help—than some anonymous boob from a call center in the Rockies. Bottom line: When researching a DSL provider, you should do your best to determine whether the business that intimately knows your DSL situation is the same service that answers your support calls. ■

DSL terminology hell

CLEC (competitive local exchange carrier): A result of the Telecommunications Act of 1996, competitive local exchange carriers have their own network and switching offices, and they compete directly with established local telephone services. Covad and Rhythms NetConnections are both CLECs.

DHCP (dynamic host configuration protocol): A DHCP server allocates and assigns IP addresses to devices on a network.

DLC (digital loop carrier): DLCs bundle a number of individual telephone lines into one digital signal.

Telephone companies began to install DLC frames around their existing wire centers in the 1980s to keep up with rapid expansion of telephone services. Unfortunately, not all DLCs support DSL connections.

DSLAM (digital subscriber line access multiplexer): This is the gadget that gathers up all the DSL signals from your neighborhood and sends them out onto the Internet.

PPPOE (point-to-point protocol over Ethernet): This protocol is ideal for service providers because it integrates easily with their existing dialup infrastructures. It's not so ideal, however, for sub-

scribers, as it's usually associated with dynamic (changing) IP addresses, and requires that users "log on."

STATIC IP An IP address that doesn't change, making it easier for outsiders to find you on the Internet. A dynamic IP, on the other hand, can change each time a user logs onto his or her DSL service.

USF (Universal Service Fund): Mandated by the 1996 Universal Service Act, the goal of this fund is to "promote the availability of quality services at just, reasonable, and affordable rates." In other words, it's a tax. (Read about the USF at www.fcc.gov/ccb/universal_service/welcome.html.)

And here's an acronym everyone searching for a DSL provider should know:

BBB That stands for the Better Business Bureau, and it should be your last stop before signing up with a provider. Go to www.bbborg and locate the Better Business Bureau office of the state where your prospective ISP is based. The BBB will tell you if there are open complaints against the company, and whether the company has worked to resolve those complaints or is giving its customers the cold shoulder. The BBB is funded by you, the taxpayer, so make use of it!

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Ask the Doctor

Symptom → Diagnosis → Cure

Are problems with your PC getting you down? We're more than happy to help with your PC's ailments, but first you need to tell us about them! If you have questions, send them to doctor@maximumpc.com. Make sure you include your name and hometown, and that your questions are written in complete sentences... in English. Letters that require decoding by the CIA will be summarily deleted. Just remember: The Doctor gets lots of e-mail, and there's no way he can respond to each and every query.

FireWire vs. USB 2.0, Round 14

I just heard about this new USB 2.0 thing and wondered if I should upgrade my FireWire external hard drive to USB 2.0? Right now, I'm using the drive mainly for video editing. If you don't think I should use USB 2.0 for my hard drive, what do you think it's good for? How fast is it compared to FireWire, and what are its limitations?

—MARTY ATKINS

The Doctor is pretty fond of USB 2.0, Marty, but in this case, he thinks you might want to stick with FireWire. USB 2.0 is an alternative to FireWire, but not neces-

sarily a replacement.

Here's how they stack up: FireWire has a maximum band-

width of 400Mbps, which translates to 50MB per second. USB

2.0 has a maximum bandwidth of 480Mbps, which is equivalent to 60MB a second. But

these are *maximum* bandwidths, which you will probably never see achieved by your peripherals. So it's unlikely you'll see much of an improvement in speed using a USB 2.0 device instead of a FireWire one.

But given that you use the drive mainly for video editing, there are two more big fat reasons for sticking with FireWire. One, FireWire is the standard connection for digital video cameras, and some pro-level DV editing solutions (such as AVID) actually qualify specific FireWire hard drives. And, as if that weren't enough, FireWire peripherals are capable of peer-to-peer transfers, meaning that, for example, you can edit footage with two digital video camcorders connected via FireWire without having to connect them both to a PC first.

Still, don't turn up your nose at USB 2.0. It's

ever so slightly faster than FireWire, is perfectly competent for most peripheral tasks, and has a feature FireWire can't boast: Backwards compatibility with USB 1.1, the connection you'll find just about anywhere you go.

Got Wood?

I want to make a PC case out of wood. I'm wondering if I can use the motherboard standoffs that are used in a standard PC case, or do I need special standoffs, or does it even matter for a wood case?

—ERIC SCHNEIDER

We frequently test motherboards sans cases in the Lab, but we'd never dream of running one for an extended period of time without a case. The PCI and AGP slots are easily damaged if the cards aren't firmly mounted, such as in the slots that a conventional case provides. You'll want to make sure you have a way to securely mount the PCI and AGP cards, and that your drives are able to run without any unwholesome vibration.

Furthermore, a PC should have an electrical ground running between the mobo and the power supply to supplement that of the ATX power connector. Normally, the metal case serves this purpose.

What can you do to ameliorate this problem in a wooden case? If you're using metal motherboard standoffs, simply connect your power supply to one of the standoffs using a 20-gauge solid-copper insulated cable. If, on the other hand, you're using a nonconductive motherboard standoff, then fasten the motherboard end of your grounding wire to the ATX I/O connector—with the keyboard, mouse, and USB ports. The other end should connect to the power supply.

Speaking out about Speakers

I am the proud owner of a set of 4.1 Klipsch Promedia speakers, but there is one thing that frustrates me. After searching through the company's web site, I found nothing that would lead

me to believe an upgrade is available for the 5.1 setup (center channel and control tower). I forked over \$250 for the very best in computer audio; but for me to get 5.1 sound, I have to fork over another \$400 for a whole new system. Am I to believe that Klipsch cannot offer a center channel and control tower to 4.1 series owners at less than the cost of a 5.1 set? I'm sure that there are many other 4.1 owners who feel the same frustration as I.

—GREG ROEBKE

As a matter of fact, Greg, the Klipsch 5.1s do include a significantly upgraded subwoofer. The new sub offers a six-channel BASH amp and two 8-inch woofers. The original 4.1 sub offers two 6.5-inch woofers and has just a five-channel amp. Unfortunately, while it was possible to upgrade version 1 Promedia 4.1s to version 2 fairly easily, there are too many components that need replacing to easily and inexpensively upgrade from the 4.1 to the 5.1 system.

And Now, a Shameless Plug for This Month's How-To

I do a lot of CAD and *Photoshop* work, and I want to run two monitors on my PC. HP, the manufacturer, says I should be able to, however, I must first disable my onboard videocard (ATI RagePro Turbo) and install a separate videocard. After installing an additional videocard, my machine would not boot. It just sat there beeping at me. I have one slot available to me. Are there videocards that will allow me to run two monitors? I own an HP M70 17" monitor and an NEC MultiSync XV17 monitor. Both have a standard VGA cable. Any suggestions?

—DAVID R. KRAJEC

Your best bet is to buy a single card that will drive two displays. Unfortunately, you didn't specify whether you have a free AGP slot, or if you're limited to a PCI-only multi-mon solution. If you have only one PCI slot available, you might be in trouble. We weren't able to find multi-mon support in a single PCI card that hasn't been officially discontinued. But, you should be able to find a GeForce2 MX PCI card if you dig around on the net a bit.

The good news is that there are lots of



The Doctor doesn't see much reason to upgrade your FireWire hard drive to USB 2.0, especially because FireWire includes some secret sauce that works well for DV.

AGP cards that will do the job. All of the GeForce4 (both MX and Ti) and Radeon 8500 boards should support multiple monitors, and most of the GeForce2 MX boards at least offer multi-mon support as an option. (See page 60 for more info about multi-mon support.)

Hard Times for the Hard Drive

Any ideas on how to get some data from a dead hard drive?

—ROBERT BANNER

As a general rule, from an end-user standpoint, once it's dead, it's dead. Sure, in certain circumstances, you can use software, such as PowerQuest's *Lost and Found*, to recover a couple of files—if you're lucky.

If you've lost data that you really, *really* have to get back, consider a professional data-recovery operation. DriveSavers Data Recovery (www.drivesavers.com) will attempt to retrieve your data from a dead disk. The average price is around \$700, so this isn't for the light of pocket. For kicks, we got an estimate for a dead 20GB Western Digital drive we had floating around the Lab. For a five-to-seven day turnaround on the drive, DriveSavers gave us an estimate of between \$575 and \$1,900. Naturally, if the data you want isn't recovered, you owe nothing.

Madge Says...

Call me a neat-freak or a worrywart or both, but please help me with this one. My case sucks in a lot of dust, which now covers my mobo and cards. Does this present a hazard in cooling? Also, how can I clean it safely? I will be thankful for any advice you can give me.

—MARK CHAMBERS

While the Doctor hasn't ever heard of dust killing a PC, it is possible. A dust-bunny farm inside your PC is definitely *not* a good thing. You'll need to do two things to fix your problem: First clean up the mess you've made, then prevent it from happening again. To clean your PC, use compressed air. It's great if you have your own compressor, but if you don't, you can head down to CompUSA or BestBuy and pick up some canned air. By using canned air and a vacuum cleaner in tandem, you can safely knock the dust loose, then suck it up before it reattaches itself to your precious rig.

To solve the dust problem for good, make

an air filter for your PC's intakes. Head down to your local hardware store, grab a roll of electrostatic air filter, and cut swatches to fit each and every intake on your PC.

This should dramatically cut down on your dust problem. We also recommend vacuuming your computer room while you're at it.

Unsupported RAID-Controller Flummoxes WinXP

I set up a system using an Asus A7V266-E and chose the RAID 0 option. The Windows XP installer doesn't see the RAID array as a drive when I have to choose where to install the OS. Can you help me?

—LOREN FURGISON

F6. It's all about F6 these days. The problem is that your Asus motherboard's Promise RAID controller isn't supported by WinXP out of the box. You'll need to download the latest Promise drivers from Asus's web site (www.asus.com) and save them to a floppy disk. When the WinXP installer first starts, watch the line at the bottom of the screen. When the installer is at the "Setup is inspecting your computer's hardware configuration" step, press the F6 key. Press S to specify an additional driver and insert the floppy disk containing the Promise drivers for Windows XP.

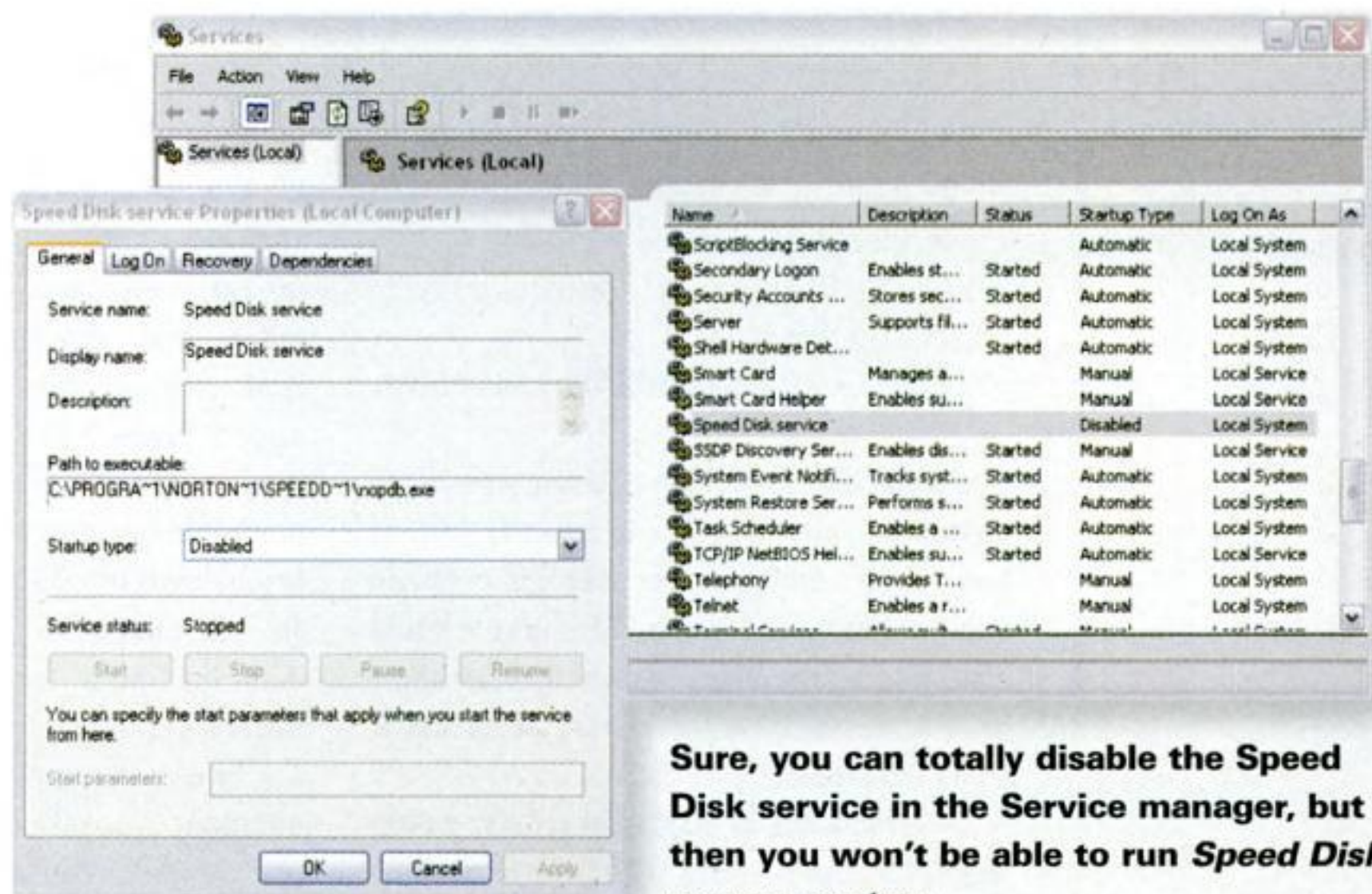
Install Windows as you normally would, and enjoy your RAID array.

WTF is NOPDB?

I'm wondering why, when my computer is idle for a while and I try to resume use, a process called NOPDB.EXE is eating 30-to-70 percent of my CPU power at any given time. How can I kill the sucker or at least cripple it so it won't hog my CPU cycles?

—SCOTT GLAZER

After looking at a few of our Windows XP systems and digging around in our Registry a bit, we were able to find out that NOPDB.EXE is the Norton Speed Disk service. It's eating CPU cycles as it defragments your hard drive. If you want to disable it, you can either uninstall Speed Disk or turn off the service.



Sure, you can totally disable the Speed Disk service in the Service manager, but then you won't be able to run Speed Disk on your system.

To disable the Speed Disk service, go to Start > Control Panel > Administrative Tools > Services, right click Speed Disk Service, and select Properties. Change the Startup Type to "manual," and NOPDB.EXE won't start unless you tell it to. Of course, we don't really understand why you'd want to do that, because the defragment-as-you-go functionality is a touted feature of Norton Utilities.

If you don't want to totally cripple Speed Disk, you can fire up the app, then go to View > Global Options, and set both the Priority and Memory Usage to "Low." This saved a few CPU cycles and a few megs of RAM on our test system.

Athlon Instability Revisited Again... and Again... and Again

I have this problem with my GeForce2 GTS 64MB videocard; it occurs most

"If you've lost data that you really, really have to get back, consider a professional data-recovery operation."

frequently when playing games, but also happens when browsing the web! Problem: My computer simply freezes; if there's music playing, it will play the last note over and over again. After a few seconds, maybe 30 at the most, my computer will reboot automatically. I'm using the latest nVidia drivers and have had Windows XP fully updated from Windows Update. I've tried using a different card—the GeForce2 MX 200 64MB—and the problem decreased, but it still happens. Here's what I have:

- O/S: Windows XP Pro
- CPU: 1.2GHz AMD Athlon
- MB: Asus A7M 266 (most current bios)
- VIDEO: GeForce2 GTS and/or MX 64 MB

- RAM: 256 DDR
- Plenty of coolers!

So, please, I really need some help on correcting this issue.

—MICHAEL LINNEMAN

When you have an Athlon-based system that's unstable, your problem is usually one of two things: a wimpy power supply or outdated 4-in-1 motherboard drivers. Of course, it could also be one of the other problems that can affect any PC, such as dirty power from the socket or a cooling problem.

We recommend a 300W or greater power supply for anyone with a 1GHz or faster processor, a GeForce or GeForce2 videocard, and more than one hard drive or lots of RAM. Also, you need to get the latest 4-in-1 drivers for your motherboard from the manufacturer's web site—in this case, www.asus.com. Do not confuse this with the BIOS, which is a totally dif-

"A PC without an operating system is like a car without a driver. Everything's there and working, but the car ain't going anywhere."

ferent beast. While we recommend keeping your BIOS up to date, it's not as vitally important as having current 4-in-1 drivers, which control things like your PC's AGP port, IDE controller, and power management.

If new 4-in-1 drivers and a better power supply don't help, dirty power might be your problem. Frequent brownouts, line sags, or spikes can cause your PC to lock up. An inexpensive battery backup may be the solution. Battery backups even out sags and spikes, which should help prevent the electric companies' problems from crashing your rig.

More Features That Look Like Bugs, and Vice Versa

I like to use MSConfig to turn off programs that start up automatically when my PC boots, to keep my memory free of unwanted programs running in the background and to keep all those little icons out of my System Tray. Who doesn't, right? But I've noticed that this line loads twice: LoadPowerProfile Rundll.exe PowerProf.dll, LoadCurrentPwrScheme.

Am I committing a boo-boo if I disable the second one by unchecking the box? It does not seem to have any effect on my system if I do. Why does this line have to load twice?

—JOHN CARRIGAN

Like a wall switch that has no apparent effect on any light or outlet in the house, these two lines can be unsettling every time you see them.

Clearly, they have something to do with power management—but what? And why do they appear twice? And why doesn't unchecking them bring down the OS? As you suspected, John, the Doctor has the answers.

Two power management profiles are loaded when Windows starts. The first one is a default power management profile that's used before you log on to Windows. Once you log on, a second profile is loaded that contains your custom preferences (or the individual preferences of each user).

Unchecking the boxes simply disables power management altogether. This, presumably, is not a result you want. So bear with it and leave them checked.

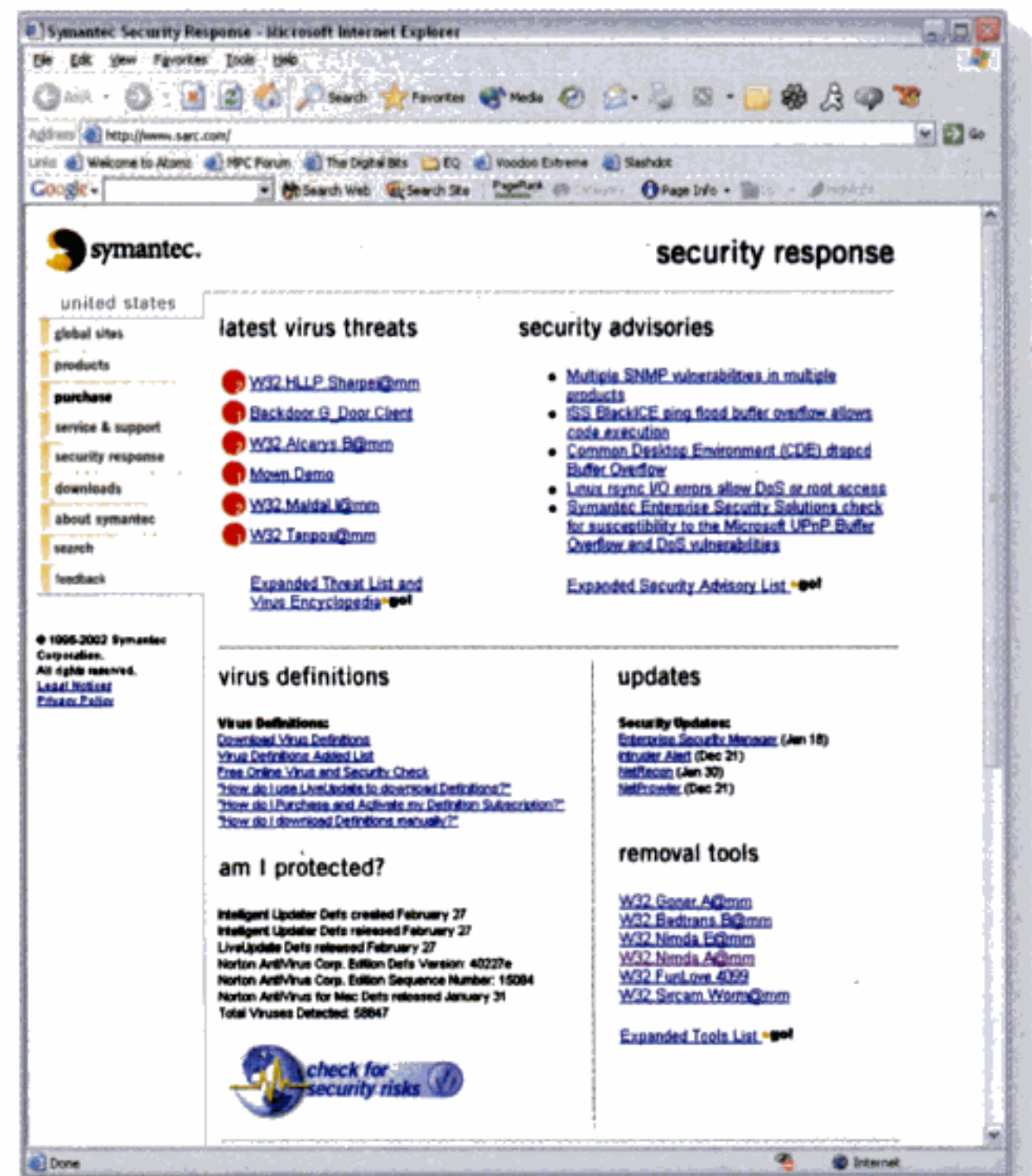
Nimda Ate My PC!

I have Windows XP and am networked to another computer with Windows 98. When I leave my computer idle for about 30 minutes, a box comes up from my antivirus software saying that the I-Worm/Nimda virus is found in the path C:\System Volume Information. After this occurs, the system undergoes a severe loss of performance. I cannot find this folder using My Computer or Windows Explorer, and it is not a hidden folder. However, when I open Nero Burning Rom or my antivirus software, it sees the folder but cannot access it. Why can I see this folder in Nero Burning Rom and my antivirus software, but not in Windows Explorer, and how should I eradicate this virus.

—MARK "EL" NINYO

Well, Mark, anytime the Doctor gets a nasty virus, he heads to SARC (www.sarc.com). The Symantec Antivirus Research Center is a great resource on new viruses even if you don't own a Symantec AV product. When we searched SARC for Nimda, we were linked to this page: www.sarc.com/avcenter/venc/data/w32.nimda.a@mm.removal.tool.html, which gave us a handy-dandy tool to remove Nimda from our system.

If you run across a virus you can't get rid of by using a common tool, the only way to abol-



If you've got virus troubles, or you just want to find out what a particular virus actually does, head to www.sarc.com and get the inside skinny.

ish the little critter for sure is to totally wipe your hard drive.

The best defense is a good offense, though. The Doctor runs antivirus software on every PC he receives e-mail on, and downloads new virus definitions first thing every morning. Needless to say, he hasn't been infected in a long, long time.

Write-Protecting the Registry

Is there a way to write-protect the Registry in Windows ME to prevent a person or spyware from modifying the settings.

—VIC WALLER

Write-protecting the Registry would be a bad thing. Almost every application you use stores its settings in one of the Registry's files, so write-protecting those files could cause anything from app crashes to a complete and total failure to run. Even something as simple as changing a setting in one of the options menus of your favorite app might crash the entire system. Hell, if you write-protect the Registry, we'd be pretty surprised if the system even booted.

Now that we all know that write-protecting the Registry is a bad thing, there are a few apps you can use to periodically back up your Registry, including Regedit. Open Regedit by going to the Start > Run menu and typing regedit.exe. Once Regedit is open, go to File, then Export, and under the Export Range, select All. The .reg file this produces is an exact backup of your Registry. Be warned, this can create a fairly large file—80MB on the system we tested—so don't expect to back this up to floppy.

EXTRA! EXTRA! Special Doctor Supplemental!

Build Your Own PC

Reader's Tips & Questions

We asked you to write in with your best PC building tips, and boy did you! *Maximum PC* readers are a knowledgeable bunch, especially when it comes to building PCs. Here are our favorites from the mailbag.



Take This Prong and Shove It

I was reading the March article on building your own computer, and one of the safety tips you gave was to unplug the power supply. However, I have heard otherwise. When I took my A+ course, my instructor said to leave the power supply plugged in, but to shut off the power with the switch. The logic behind this was that the third (round) prong of the cord functions as a ground. He also suggested taking a spare cord and breaking off the two power prongs, leaving only the ground prong in, and using that as a ground for the case. Which way is right?

—T.J. TRAN

Grounding yourself before you handle your PC's innards is always wise, but we don't think your instructor's tip is a very good idea. Our main concern is that, in rare instances usually involving poor wiring or faulty equipment, the ground plug can carry a current, which could electrocute the poor schmuck working on his PC. What we do recommend is that you attach your antistatic wrist strap to your PC's frame *before* unplugging the power supply. That way, you're grounded with regard to your PC, which is all that really matters.

Another Opportunity to Crack Wise

Concerning the "Build Your Own PC" feature, I would like to make a suggestion I learned from a previous employer and have since passed on to all my students in the computer classes I have taught. Switch steps 2 (Mount the Motherboard) and 3 (Install CPU).

That's right, lay the motherboard on the pink antistatic foam it comes with and mount the CPU, CPU fan, and memory first, then mount the partially assembled motherboard on the motherboard tray. I do all my physical pushing, pulling, and twisting with the motherboard on a stable, flat surface vs. risking cracking because it's already mounted on a handful of metal posts. I also gain access from any angle, which is especially helpful for the physical exertion needed to mount that CPU cooling fan!

I'm sure no one wants to drop \$100, \$200, or more on a motherboard, then break it before you can boot it for the first time!

—ANDY SPISAK

We frequently test mobos in the Lab on a static-free surface before we install them, but it's not because we're concerned about breaking the motherboards. If you properly mount the mobo using all the available standoffs, you

shouldn't need to push hard enough to actually break the board. Plus, in some older Pentium 4 systems, you can't actually mount the fan until *after* it's in the case. Still, readers should go with the strategy that makes them feel most confident.

Exotic Nutdriver Mounts a Heatsink

I've got a handy tip for all who attempt to "build it" themselves. When I install my heatsink onto the mobo, I use a 3/6", or 1/4" nutdriver instead of a screwdriver or pliers. A nutdriver gives me more control of the process and prevents deadly slippage. Scraping a screwdriver blade across your mobo can be pretty scary, even if you don't damage anything.

—ERIC HIGGINS

Where Do You Get Those Wonderful Toys?

I was just wondering where you bought all the equipment in your "Build Your Own PC" article? I have searched the web sites you listed, and I can't find the equipment at the prices you published.

—KEVIN McDONALD

Generally, when we mention prices in the magazine, we list the MSRP, as was the case for the prices listed in the March issue. Prices in the PC market fluctuate on a fairly regular basis. However, if you're looking for the cheapest prices you can find try www.pricewatch.com. Pricewatch is a search engine serving many of the mom-and-pop computer stores, and you'll usually find the best prices there.

Before you actually buy anything from Pricewatch though, you should check out the prospective seller at Resellerratings.com; that way you won't have to go whining to the Watchdog next month!

Prepare to Be Surprised

In your "How to Build a PC" article, you forgot to partition the hard drive—unless XP has a utility to do this, which would surprise the <expletive deleted> out of me!!

—DAVE STYRES

Well, we hope you're reading this near a bathroom, Dave, because Windows XP, like every OS since Windows 95, partitions the hard drive as part of the install process.

Picking Nits

In your PC building article, you should've switched steps 7 [putting the mobo in the case]

and 8 [connecting the power].

More than once, I've come across an obstacle to installing the

power, only to have to pull the mobo out again.

Also, in your P4 options (page 38), you state that the Northwood P4 "A" begins at 2.2GHz, when I know it starts at 2.0GHz—I have one.

—PETER DUNN

Attaching the power connector first is advisable, especially if you anticipate an obstruction once the board's in place.

As for the Northwood starting at 2.2GHz, here's Senior Editor Gordon Mah Ung's official response on the topic: "I think this is simply a misinterpretation of 'starts at,' and in hindsight, my interpretation probably doesn't make any sense. To me, the Northwood starts at 2.2GHz because that was the fastest speed available at launch. I viewed the launch of the P-III the same way; to me, the P-III starts at 500MHz because that was the fastest the manufacturer could hit at launch. There was of course a P-III 450MHz that shipped at the same time as the 500. Call me jaded, but it's a view I've developed over the years: The fastest CPU at launch is it. The others are simply bin speeds created by bad process or marketing departments."

But What If I Want RAID?

The article was very informative but did not answer some important questions for me. If you changed the Dragon plus, Athlon 1800 setup you described to a RAID setup with two Western Digital drives, how would that change the BIOS and installation procedure? Setup bios for SCSI, install windows XP home, then install drivers? Or should I install drivers on the hard drive, then the XP Home? I'm confused! How can you install drivers to recognize the RAID setup and format the two disks as one without losing the drivers? Sorry, this is my first time through this stuff, being a converted Mac fanatic.

—BILL GILBERT

If you want to run Windows off of a RAID array, you need to make sure you have the RAID card's drivers on a disk before you start. Then change the boot order in the BIOS so that the CD-ROM drive is at the top of the boot list, followed closely by the External Adapter or SCSI device (depending on your BIOS). Configure your RAID array in your card's BIOS setup screen, then boot off the Windows XP Install CD and press F6 when the white bar at the bottom of the screen prompts you to install drivers for third-party devices. From that point on, you can install Windows to the RAID array as if it were any other hard drive. ■

How To...

■ ■ ■ A step-by-step guide to tweaking your PC Experience

CONFIGURE A MULTI-MONITOR RIG

We show you how to execute a desktop land grab by adding a second display to your system.

RIG



BY WILL SMITH

Are you a *Photoshop* jockey? A master of multitasking? Do you regularly have 10 browser windows at the ready and another five or six apps open at once? Have you thought of buying a larger monitor or running your current monitor at a higher resolution to give yourself more desktop space?

Do you have an old monitor lying around?

If you answered yes to any of these questions, you might want to consider a multi-monitor setup. By adding a second monitor, you get a lot more functionality and space than what you'd get by upgrading a 19-inch CRT to 21 or even 24 inches. In this article, we'll show you what to buy and how to configure it, and what your multi-mon display can do for you.

Shopping List

Before you start, you might need to make a trip to your friendly neighborhood computer store. Here's your ingredients list:

- A videocard that features multiple-monitor support, such as various iterations of the GeForce4, Radeon 8500 and Radeon 7500, as well as certain GeForce2 MX and Radeon VE boards. This is the recommended config, but you may also consider...
- A PCI videocard to complement your current AGP videocard. If you go the two-card route, make sure to check out the hardware compatibility list at www.microsoft.com/hcl to ensure that the card you choose works with your current 3D accelerator in a multi-monitor config. Incompatibility issues and driver conflicts can cause real problems with a two-card rig.
- You'll need a second monitor (duh). For a secondary display, we prefer an LCD flat panel to minimize the amount of physical desktop space that's occupied, but really any monitor will do. For more insight into the flat panel vs. CRT debate, see page 18. And remember: Regardless of what you buy for your secondary display, you need to make sure it will connect directly to your PC (i.e., don't buy a flat panel with a DVI interface if you don't have a DVI connector on your videocard).
- Finally, you'll need tools to open your case and install a card.





2 Configuring your multi-mon display

After Windows is up and running again, go to the Display control panel by right-clicking the Desktop and selecting Properties. Go to the Settings tab. Assuming everything is set up right, you should see something like the screenshot above. Right click the second display, select Properties, and click Attached. This tells Windows that you want to enable the second monitor.

After you press Apply, your second monitor should come to life. Press the Identify button and drag the monitors on the control panel until they are arranged in the same positions as the monitors on your desk. Click the monitor you want to define as your main display and check "Use this device as the primary monitor." This setting controls where the Windows Taskbar is located by default, and also where DirectX games are displayed.

1 Installing the card

We're going to assume you have a shiny new AGP card that supports two monitors. We used a GeForce4 MX 460 reference board for this article; it features a DB-15 adapter for an analog CRT, and a DVI connector for a flat-panel LCD. Install your new videocard in your PC as directed by the manufacturer, and download and install the latest available drivers. Now connect your secondary monitor to the videocard and move on to step two.



3 Arranging your desktop

Now that you've gotten your PC configured properly, you need to configure your desktop. We recommend that you position both displays at the same height, then place your keyboard in front of the primary display.

Now that everything's up and running, you can run two apps fully maximized and see both at the same time. For example, you can edit an HTML page on one monitor, while looking at a preview of your work on the second display. Your possibilities are truly endless.

Troubleshooting

If you're having trouble getting your rig to work, here are a few basic tips:

- When you begin mixing videocards and drivers from separate manufacturers, trouble is inevitable. So if at all possible, you should run a single dual-head videocard that drives both displays. Single-card setups are immensely easier to get working right in short order, and they require driver support from only a single manufacturer.
- If you don't see a second monitor icon in your Display control panel, it's likely your system isn't recognizing that a second monitor is attached. Make sure both monitors are connected to the PC and that you're *not* using a DVI-to-DB-15 adapter from a third-party manufacturer. DVI adapters are finicky enough, and you definitely don't want to use one that wasn't bundled with your videocard.
- To see the second monitor icon, you may also need to enable a multi-monitor toggle hidden somewhere in your card's control panel. Consult your card's documentation for more details.
- If your two-card rig doesn't work right away, go into your PC's BIOS and try changing the Init Display First setting. If it's set to initialize the AGP card first, change it to the PCI card, or vice versa. Be aware that in Win98 and WinME this BIOS setting controls which card serves as your primary 3D accelerator, so if you play games, you'll probably want to initialize AGP first.
- If moving your cursor over the edge of one desktop places it in an incorrect position on the second desktop, you need to properly align your monitors in the Display Properties control panel.
- Make sure you're using the most recent version of the video drivers for all the videocards in your system.
- If errors persist, run both displays at the same resolution and bit-depth.
- While Win98, Win2000, WinME, and WinXP all support multiple monitors, WinXP definitely handles the extra demands more gracefully. If older OSes bring your multi-mon rig down, try upgrading to WinXP. ■

In the Lab

A behind-the-scenes look at Maximum PC testing

It's a Desk Lamp, Right?

Once again, the latest iMac is a story of beauty before brawn

Nothing says "wow" like Apple's new iMac. It's just too bad that Apple focused its attention on the machine's industrial design instead of its actual performance. We've had the stylish little dandy humming away in the Lab since late February, and while it's not quite relevant enough to warrant a full review, we thought you'd still want to know how the intriguing little desk lamp thingie performs. Not that you would ever buy one, of course. But you may know Apple-leaning newbies—grandparents, teenage girls who watch *Felicity*, aging hippies who've retired to Marin County—who first want to hear your advice.

Well, here's the poop: The fastest of the new iMacs pushes 800MHz with a PowerPC G4 CPU, and Apple itself says we shouldn't "be fooled by its ease of use and other endearing characteristics. The new iMac is an exceptionally powerful computer." But the bottom line is that this baby is sloooooow.

To compare the new iMac with an equally hot new PC, we grabbed four applications that run on both Mac OS9 and Windows XP. The iMac shipped with both OS9 and OSX.1, but we opted to run tests under OS9 because so few apps are OSX.1-optimized, and if we tested the iMac under the newer OS, Apple's machine would run our benchmarks even slower.

For our PC control model, we grabbed the Polywell Poly 880NF that's reviewed on page 64. This PC boasts a 1.73GHz Athlon XP, and costs \$500 more than the iMac, but lacks a monitor as well as a DVD-R drive. But truth be told, we could easily configure a fully-decked 1.73GHz Athlon XP rig to be cheaper than the iMac, and still make the \$1,800 iMac its plaything.

The benchmark box on this page sums up the performance battle, but here's a little bit of background for you, in case you can't get your head around the lopsided results:

► **Inspire 3D:** This consumer-level 3D rendering app boasts no special instruction optimizations—nothing for SSE, SSE2, 3DNow!, or Apple's vaunted AltiVec engine. It's all about pure floating-point prowess and clock speed here, kids, and the PC kicked buttocks.

► **Photoshop 6.0.1:** For this showdown, we ran our standard home-brewed action script, which runs *Photoshop*



It may scream Audi TT on the outside, but it's nothin' but a Datsun Honeybee on the inside.

through a few dozen operations and filters. Once again, the PC dominated—performing three times faster—which is very bad news for the iMac, considering that graphic design is the Mac addict's bread and apple butter.

► **Quake III Arena:** Let's see, hmm. The iMac comes with a GeForce2 MX (with no other video options available), while the PC boasts a GeForce4 Ti 4600. Throw in *Quake III*—a game that's now three years old—and the PC comes up five times faster than the Mac. Ai-yai-yai!

► **Premiere 6.0.1:** This one was a shocker. We took our standard Maximum PC test file and encoded it to QuickTime in order to run the video on both the Mac and the PC (our test normally encodes to Windows Media, but the Mac version of *Premiere 6.0.1* doesn't support this format). The PC finished the benchmark about four times faster than the iMac. We we're using Apple's own QuickTime format!

Despite the iMac's utterly disgusting performance, we were impressed by the machine's look and packaging. Apple has truly mastered industrial design (dare we call the new iMac the Audi TT of computers?), and the iMac's out-of-box experience is probably the best available. The pivoting LCD screen is also quite stunning, but of course makes no sense whatsoever if you want to play games at anything other than the LCD's default resolution (as if Mac users play many games). The speakers are, well, adequate, but are probably better-suited as a replacement for those click-clack knocker toys that were banned in the 1970s.

Overall, the new iMac probably won't harm the women and children, and it will probably even enchant the people who buy it for basic office-related duties. But we would never recommend it to a PC user, or to a committed Mac-head who actually uses his or her computer for content production.

Clack-clack-clack! Watch your fingers, or the Feds will confiscate these babies, too.

DARE TO COMPARE

	iMac 800MHz	Athlon XP 2100+	The PC is ...
Inspire 3D	273 sec.	134 sec.	twice as fast
Photoshop 6.0.1	157 sec.	52 sec.	three times as fast
Quake III Arena	37.6fps	199.5fps	five times as fast
Premiere 6.0.1	1353 sec.	352 sec.	about four times as fast

Best of the Best

As of April, 2002

Here are our current top picks for each hardware category. Check back next month for updates.

High-end videocard:

Visiontek Xtasy Ti 4600
(GeForce4 Ti 4600)

Budget videocard:

Hercules Prophet Ti 200
(GeForce3 Ti 200)

Do-everything videocard:

ATI Radeon 8500 All-in-Wonder

Soundcard:

Sound Blaster Audigy Platinum

Hard drive:

Western Digital 1200JB

CD-RW drive:

Lite-on 32123S

Monitor:

Sony F520

P4 Motherboard:

Asus P4T-E

Athlon XP motherboard:

Soyo Dragon Plus KT266A

Consumer DV camera:

Sony DCR-TRV17

Portable MP3 player:

Bantam BA350

Photo printer:

Epson Stylus Photo 1280

Palm PDA:

Sony Clie PEG-N760C

Pocket PC PDA:

Compaq iPAQ 3835

5.1 speakers:

Klipsch Promedia 5.1

4.1 speakers:

Logitech Z-560

2.1 Speakers:

Klipsch Promedia 2.1

Our current gaming favorites: *Medal of Honor: Allied Assault*; *Bridge Commander*; *Warcraft III: Reign of Chaos Beta*; *Tiger Woods PGA Tour 2002*

Maximum PC Goes All Digital

How we said goodbye to film, once and for all

See ya, wouldn't wanna be ya, and don't let the door hit you when you leave. That's what we said to traditional film when we put the finishing touches on our new, all-digital photo studio last month.

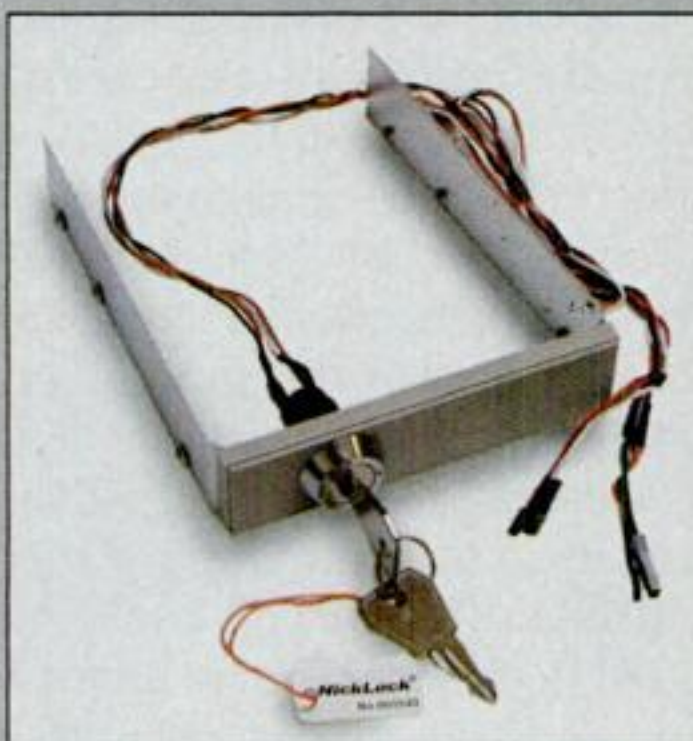
Every single original image shot for magazine is now snapped with a Nikon D1X. This state-of-the-art digital camera is capable of 5.47 megapixel images (3008x1960) that output to 16.9MB files in Nikon's own proprietary, lossless format. Besides the cool camera, the studio is outfitted with Profoto lights from Sweden, as well as commando cloth (which is used to keep ambient light away from the subject matter at hand).

By going all-digital, we don't have to spend any money on film development and scanning, and also have much more leeway when it comes to sneaking late-breaking product coverage into the magazine. (Indeed, in the old days, hardware reviews sometimes had to be delayed because product photography and film scanning couldn't be pulled off in time.) Even better, Mark Madeo, our new photo editor, can instantly check the fruits of his labor and adjust lighting and camera settings if necessary. Mark has been shooting for *Maximum PC* since 1996 (when the magazine was called *boot*), and also shoots fashion and music photography on the side—using both digital *and* traditional film cameras, depending on the demands of the task.



The NickLock Revisited

'Turn your key, Gordo! Turn your key!'



We didn't think much of the NickLock as a hard-drive sharing device, so we slammed it in a special February 2002 "Geek Tested & Rejected" blurb. But reader Dan Barnes of Orlando, Florida has since given us a truly useful suggestion for the device: Instead of rigging the NickLock to the jumpers of two hard drives to swap master/slave relationships (the NickLock's intended use), Barnes suggests using it to put a lock on your computer's power switch. It's a simple matter of plugging your power switch into one of the NickLock's leads. Once done, you can simply turn the NickLock's key to one side to fire up your PC, then remove the key. This will stop pesky IT workers like Dick Matthews from shutting down your rig without authorization. \$29, www.nicklock.com



The Adventures of the Lil'est Intern



You may wonder, as we did, what the Lil'est Intern does after hours, when all but he have gone home for the night....

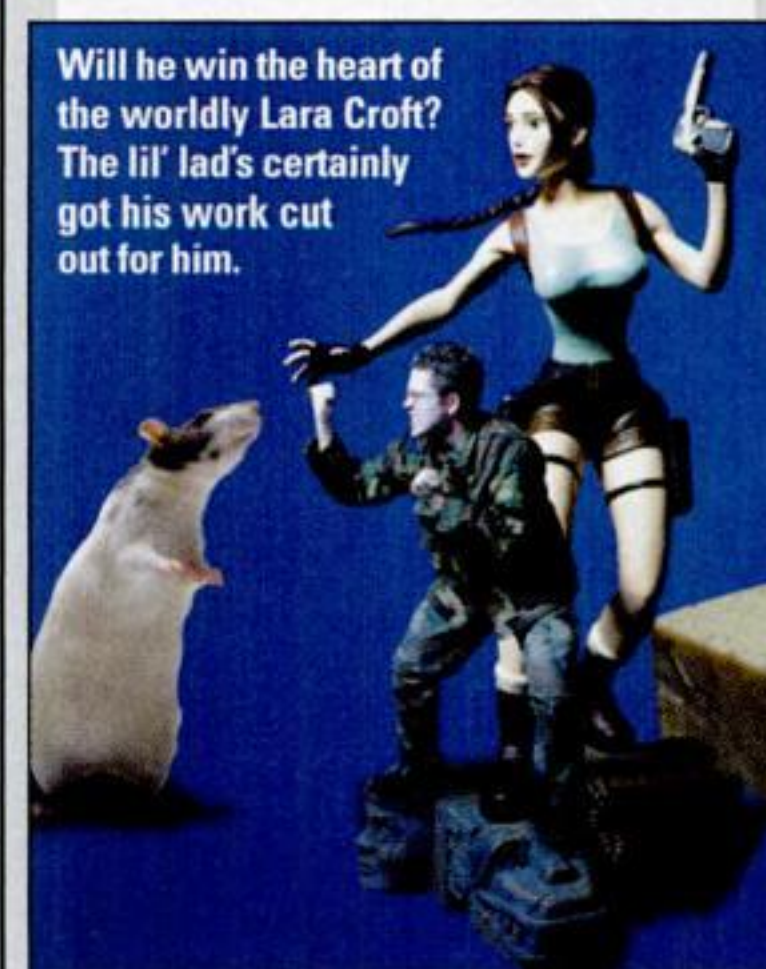
Join us as we take a peek at our pint-size helper's private life.



Demonstrating a dedication to the job unmatched by any of us full-grown staffers, Lil'est spends his free time hunting down the pesky office mouse.



But, what's this? Could it be that the tiny 'tern has developed an extracurricular interest?



Will he win the heart of the worldly Lara Croft? The lil' lad's certainly got his work cut out for him.

to be continued...

Polywell Poly 880NF

The new nForce chipset from nVidia helps put the Athlon XP back in front

How much performance can AMD squeeze out of a wee 60MHz clock-speed bump? Apparently, a hell of a lot. Buried in the heart of Polywell's new Poly 880NF system, the new Athlon XP 2100+ helped push the machine into new performance territory.

The Poly 880NF broke several benchmark records, and along with the Pavilion reviewed last month, crashed through the 200 barrier in *SYSmark2001*. All the work wasn't done by the Athlon XP, though. The Poly 880NF is the first OEM machine we've tested that sports a motherboard armed with nVidia's nForce chipset (MicroStar's K7N420), and it's also the first OEM rig we've seen that pairs an Athlon with a GeForce4 Ti 4600. Polywell also stuffed the 880NF with High Point's new ATA/133 RAID controller and a pair of 40GB Maxtor ATA/133 hard drives.

The overall package is a no-thrills, utilitarian design built for speed. As we already noted, the rig crashed the door of *SYSmark's* exclusive "200 Club," joining machines running 2.2GHz and faster Pentium 4s. But where the Polywell really excelled was in gaming—and this was a surprise, considering that



Polywell is anything but a gaming PC company. With an unheard of score of 38.3fps in *3DMark2001's* Game 4 demo, the machine was phenomenal, and we're not really sure how Polywell did it.

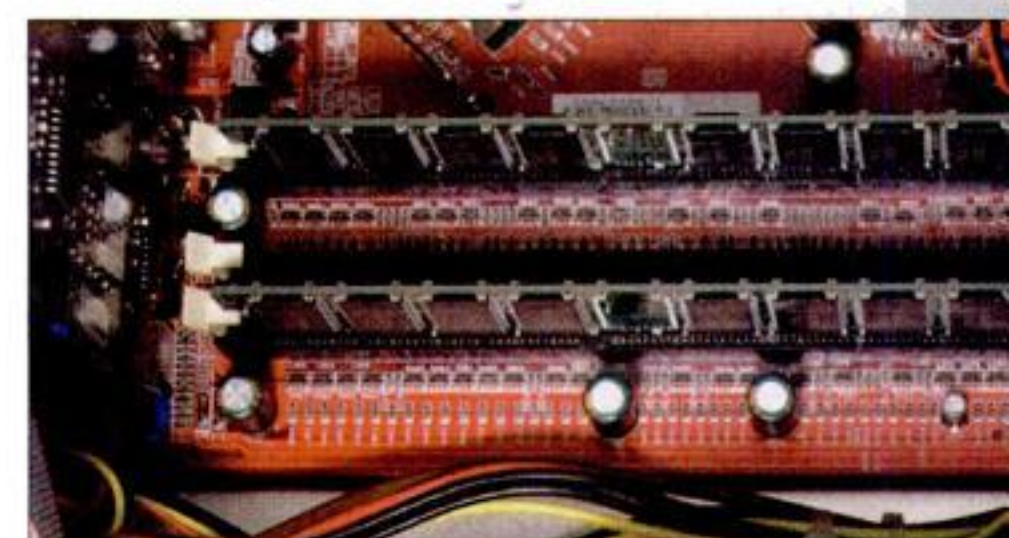
To see if the extra 3D performance was emanating from the Poly's GeForce4 card, we put the card into a 2GHz Northwood Pentium 4 machine. Surprisingly, in this new configuration, the card actually performed slower than our GeForce4 Ti 4600 reference card, despite the fact that both cards had the same GPU and memory clock frequencies. So, to see if the extra speed was coming from the Poly's drivers, nForce chipset, or some type of oddball configuration that Polywell jimmied in, we put our own GeForce4 Ti 4600 reference card in the Polywell system. In this scenario, running *3DMark2001* Game 4, our reference card could hit just 30.1fps instead of the 38fps that Polywell's card hit.

Finally, we put the Poly's original GeForce4 back in its rightful home, and once again, the machine produced a phenomenal 38.7fps. We'll continue to investigate this strange situation and report back if we determine that Polywell has done something magical to its video-

card config. For what it's worth, Polywell told us the boost comes from the nForce chipset and secret BIOS tweaks, but we personally haven't seen any 3D gaming boosts from nVidia's new chipset in our nForce/GeForce3 testing (so maybe nForce and the GeForce4 work particularly well together). In the meantime, we can only praise Polywell for its performance acumen.

Gaming aside, the Poly 880NF was no slouch. In *Premiere 6*, the machine set a new OEM rig record by rendering our mini-movie in just 159 seconds. And even though the Sony CD-RW drive

TwinBank architecture: Can the nForce's 128-bit DDR memory take credit for the Polywell's smoking performance?



is just a 24x burner, the Polywell ripped our music CD in 174 seconds. MP3 encoding executed with *MusicMatch* was the fastest we've seen from an Athlon system, but didn't compare to what we've seen in P4 Northwood systems.

Though its performance was astounding, Polywell took some strange twists with its amenities. Even though the nForce has very respectable 5.1 audio built in, Polywell chose to include a Sound Blaster Live! 5.1 card. But this bit of overkill was balanced by the unexciting Creative Labs speakers, a cheapo BTC 5 mouse, and badly spray-painted optical drives. We also think Polywell could have selected slightly larger hard drives, but some may prefer the higher burst rates of the ATA/133 Maxtors.

UNDER THE HOOD

THE BRAINS

CPU	AMD Athlon XP 2100+
Motherboard	MSI K7N420
RAM	512MB DDR266 (two DIMMs)
I/O ports	Six USB 1.1, four USB 2.0, two FireWire

DISPLAY

Videocard	GeForce4 Ti 4600
Display	available but not reviewed

STORAGE

Hard drive	Two 40GB Maxtor D740X, joined in RAID 0 with a High Point ATA/133 RAID controller
DVD-ROM	Toshiba SD-1612 16x DVD-ROM
CD-RW	Sony Spressa CRX175A1 (24x10x40)

NETWORKING

LAN	Onboard nVidia 10/100 and Lucent WinModem
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SOUND

Soundcard	Creative Labs Live! 5.1
Speakers	Creative Labs Inspire 5300 5.1 speakers

MOUSE

BTC 4D Mouse

KEYBOARD

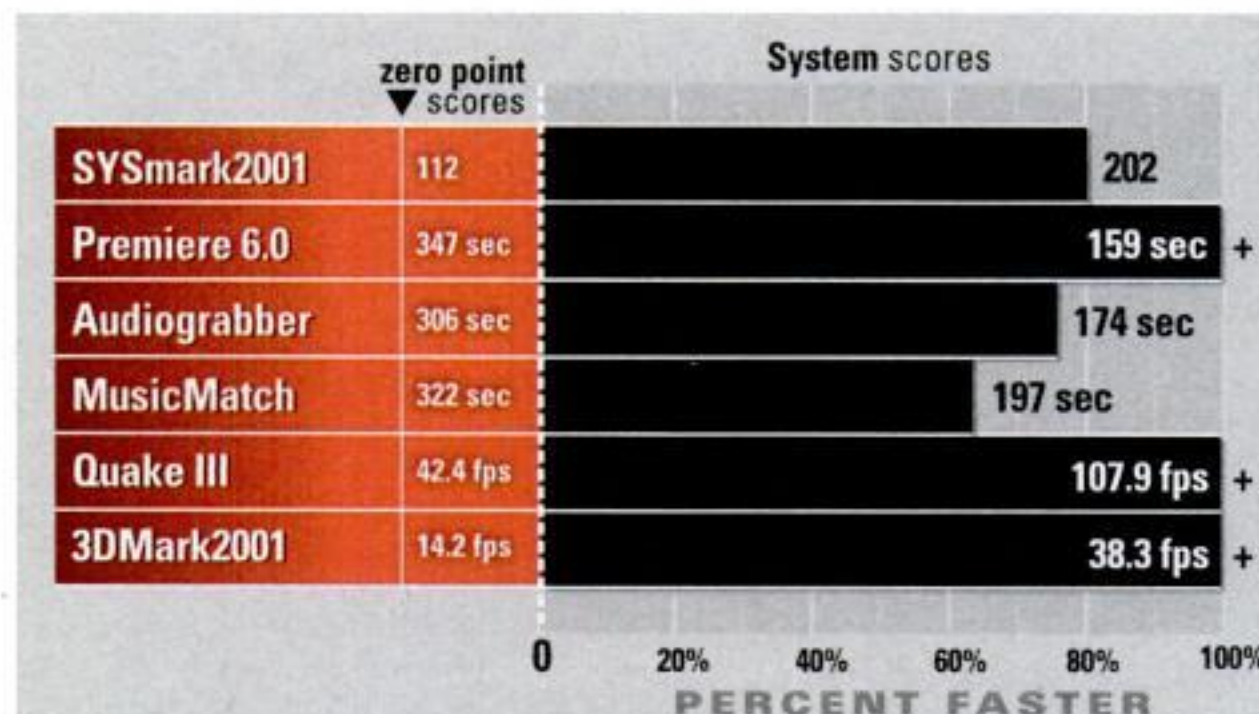
Microsoft Internet Keyboard

BUNDLE

Microsoft Windows XP, F18 Super Hornet, Descent 3, Norton Antivirus 2002, Ulead Video Studio 5.0, Easy CD Creator 5.0 Basic, MSI DVD Player

BOOT: 54 sec.

DOWN: 19

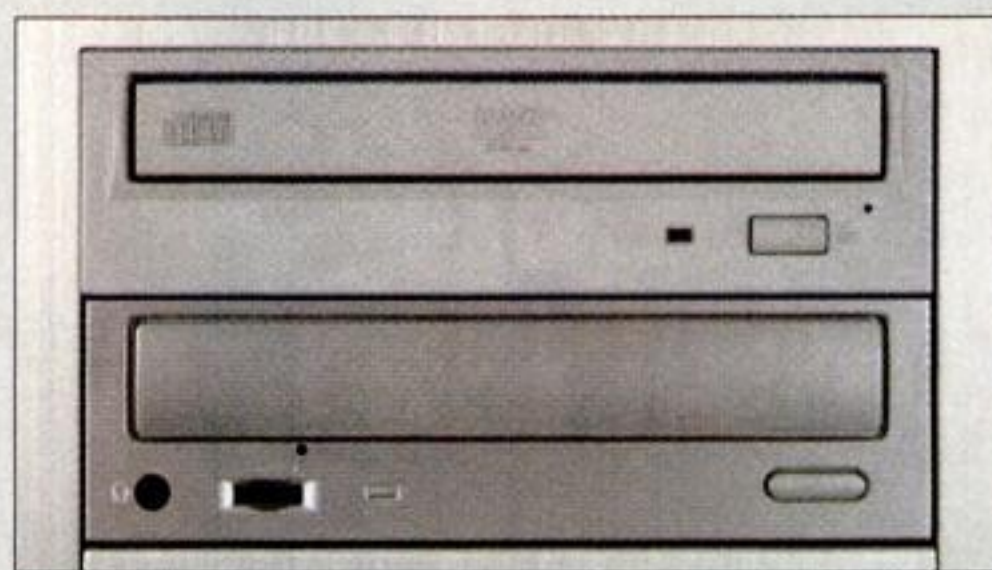


The zero-point system includes a 1.3GHz P4, 256MB of RDRAM, and a GeForce2 Pro videocard, which was substituted for a GeForce3 in the *3DMark2001* benchmark only. See the Benchmark section at Maximumpc.com for details.

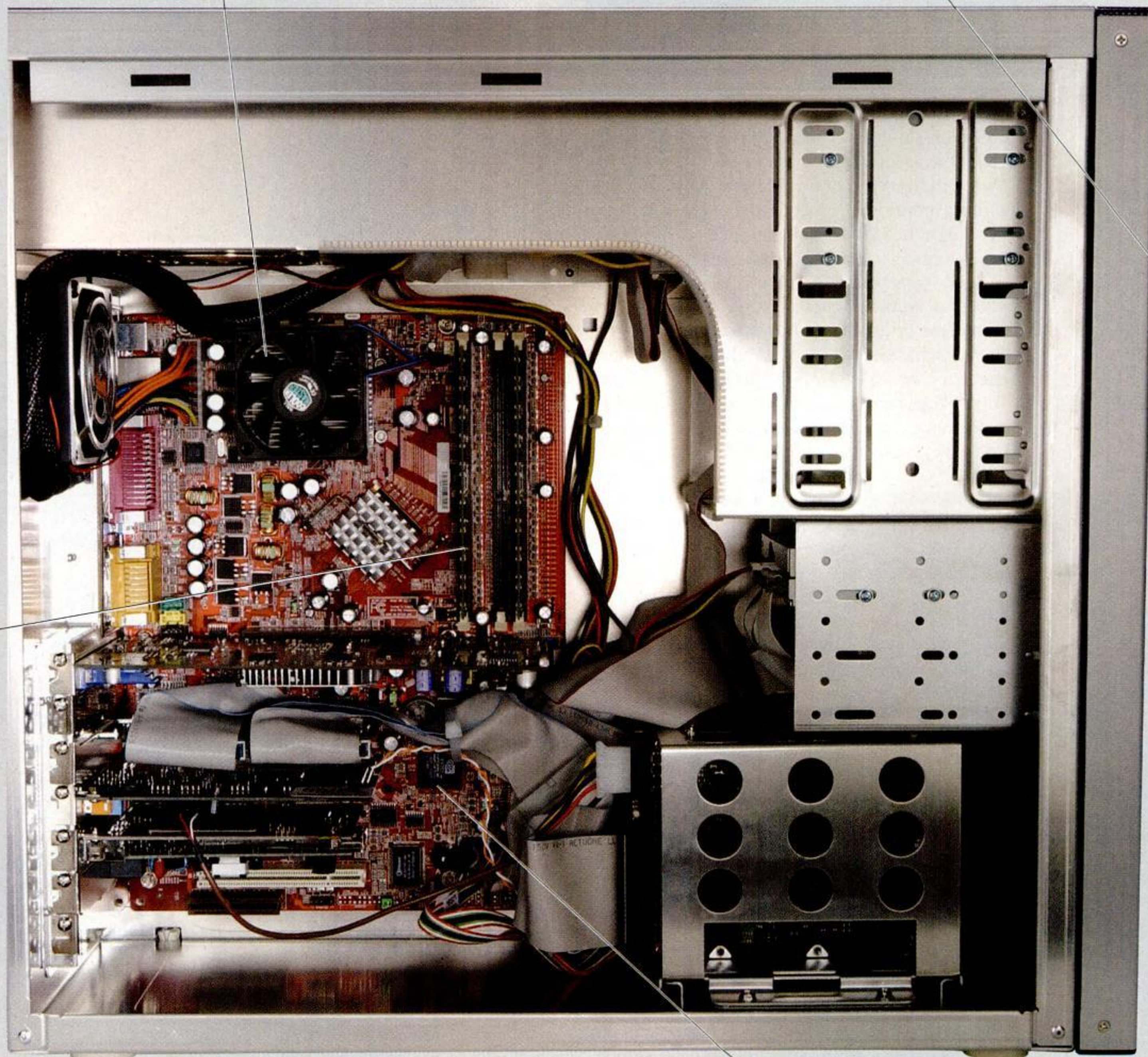


Running out of steam?

The Athlon 1.73GHz is the fastest Athlon yet, but only by a mere 60MHz.



Bad paint job, Mikey: Polywell needs to do a little more primer work on its optical drives.



Think of the Poly 880NF as a high-performance muscle car with a few quirks, like a squeaky seat spring and non-powered mirrors. It may not offer every amenity, but at the end of the day, the machine can suck up the pavement with the best of them. There are clearly some warts to the 880NF and we heartily debated how high a score it should receive, but it raised the bar in performance and for that it deserves the Kick Ass.

— GORDON MAH UNG

MAXIMUMPC VERDICT

Poly 880NF
POLYWELL

+ ASSETS

Smoking performance overall, plus special 3D gaming pixie dust.

- LIABILITIES

Blah aesthetics, smallish drive capacity, lame-o peripherals, and the CD burner isn't an industry-standard 40x.

www.polywell.com

\$2,350 (does not include display)

9



nForce audio is out: Despite having built-in 5.1 audio from the nForce chipset, Polywell decided to install a Sound Blaster Live!

UV Networks WebBox 1000

A Sun UNIX server in a populist package

Sometimes you just need a UNIX server. Whether you host several web sites on your DSL connection, run your own e-mail server, or are just tired of fooling around with puny x86 boxes, you might need the one-two punch of UNIX running on Sun hardware—which is exactly what you'll find in the WebBox 1000. Just be aware that this little prefab gem doesn't come cheap. In fact, loaded with a two-disk RAID array, 256MB of memory, and a 64-bit 500MHz Sun UltraSPARC processor, this little puppy costs more than a good used car.

So what exactly does the WebBox do? Pretty much everything that a SPARC UNIX server will do. You can host as many web domains as you want on a single IP, host mail servers for all those domains, and access your web pages using either *FrontPage* or a standard FTP client. You can also run CGI or Perl scripts on all your sites. Heck, the WebBox even backs itself up and pages you if there's a problem.

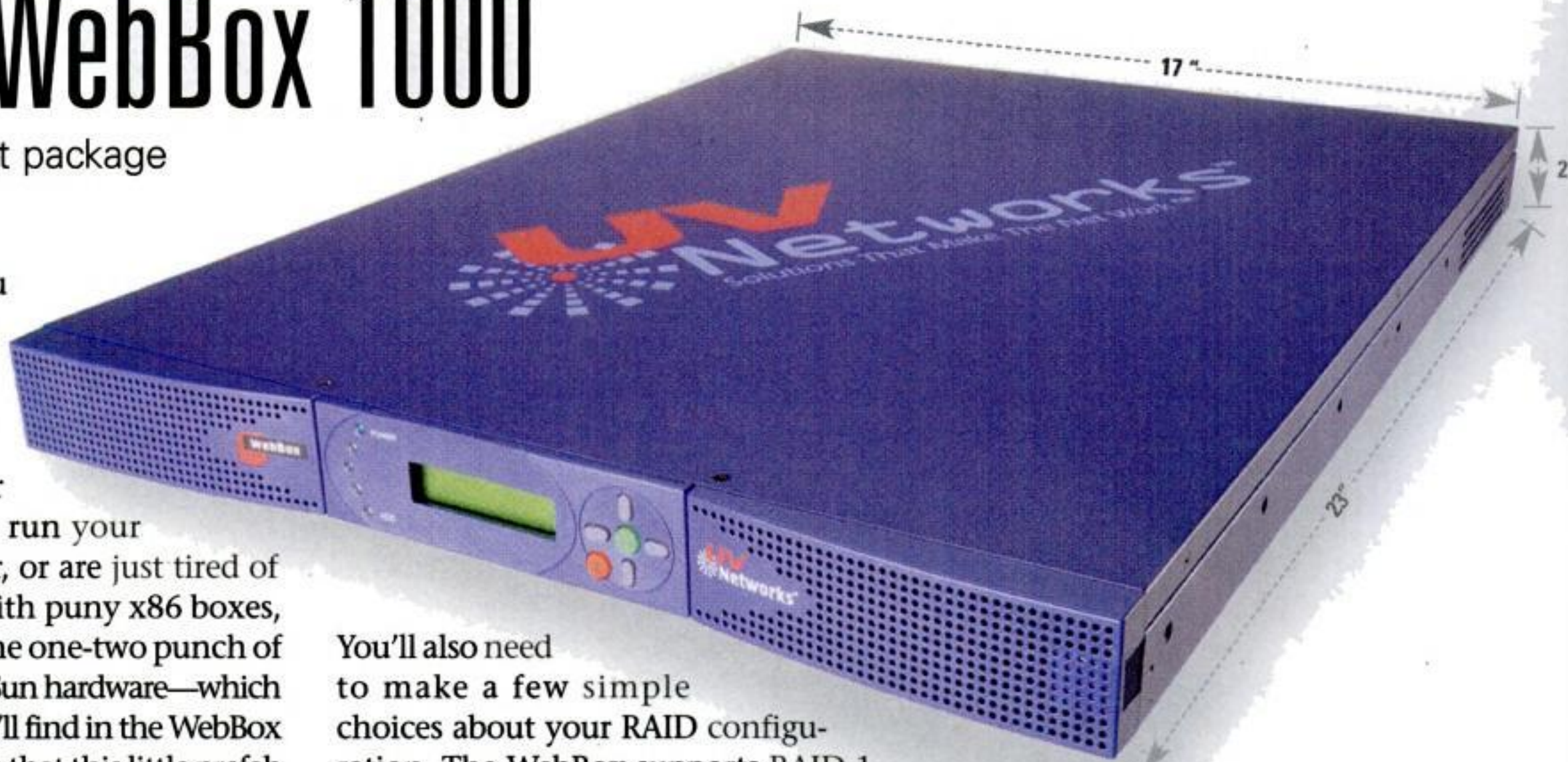
So far so good—but shouldn't any UNIX box be able to handle these chores? What makes the WebBox so special? The key is simplicity. Instead of needing an intimate knowledge of UNIX to configure and maintain this handy purple dandy, you can complete all your tasks via a well-designed browser interface. In fact, configuring the box was as simple as plugging in the power and network cables, setting the box to use either a static IP address or a dynamic IP, then opening a web browser on another machine and pointing it to the WebBox's IP.

You'll also need to make a few simple choices about your RAID configuration. The WebBox supports RAID 1 mirroring for the system volume, and either RAID 1 or RAID 0 for the user volumes. (A volume in a UNIX system is similar to a hard drive partition on a Windows box.)

After you complete your initial config, all you need to do is set up your first site. This is a relatively painless process, and requires only that you tell the WebBox which IP address you want the site to run on, whether you want CGI or FrontPage Extensions enabled, and whether you want a mail server on the domain. You can also configure the amount of disk space the site uses, the number of mailboxes it hosts, and a special account for yourself as the site's administrator. After you've done all this, you can log in and upload the actual site content. Assuming you did all the requisite work with Network Associates and your ISP to get your domain pointing to the right IP address, your site should be up and ready for visitors at this time.

The long and the short of it is that UV Networks has managed to do the near-impossible by making a UNIX web server easy to configure for someone with no practical UNIX experience. The WebBox's web-based configurator is simply *that* awesome!

But as always, there's a catch: Sun hardware and the impressive interface don't come cheap. The model we tested came with two 41GB hard drives, a 500MHz UltraSPARC-IIe processor, and 256MB of RAM, all for \$3,300 retail. That's a great deal for a 1U rack-mount-



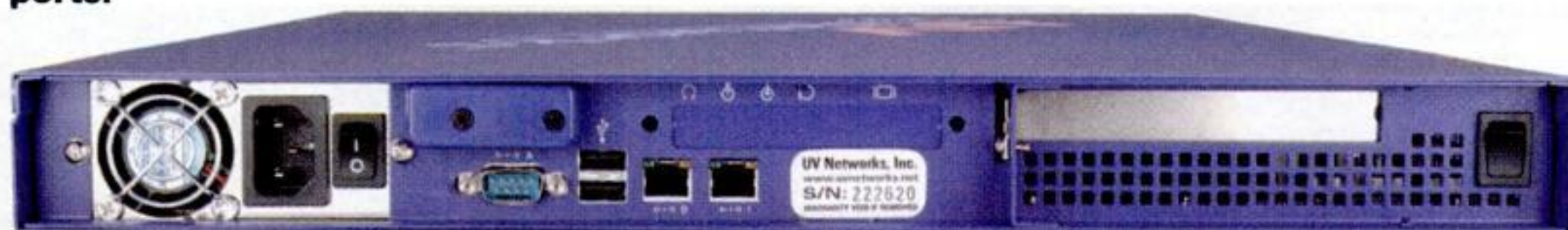
The WebBox is easily configured using the front panel and a handy web interface.

ULTRASPARC IIe AT A GLANCE

The WebBox's CPU might run at just 500MHz, but when you're talking about UNIX hardware, megahertz matter less than the CPU's ability to seamlessly dovetail with the OS and its applications. Regardless, let's talk specs.

The UltraSPARC IIe is built on 0.18-micron technology, boasts a 1.9V core and 23 million transistors, and is packaged in a 370-pin ceramic pin grid array. It's based on the SPARCv9 architecture with the VIS Instruction Set, and features 64-bit data paths and 64-bit addressing. L1 cache is 16K (two-way set associative), while L2 cache is 256K (four-way set associative). For more info, go to: www.sun.com/processors/UltraSPARC-IIe.

The WebBox might seem light on connectors, but it's got all it needs with two Ethernet ports.



SPECS

OS	Sun Solaris 8
I/O	Two Ethernet, two USB, one serial
Processor	UltraSPARC IIe 500MHz
Memory	256MB SDRAM
Hard drive	Two 41GB IBM 60GXP (though the box boasts just 60GB of maximum total storage, due to RAID mirroring functions)

able UNIX server, but not so hot for someone who's just looking for a reliable home webserver, especially when you consider that this box doesn't even include a simple routing solution.

If you want a cheap, reliable, and easy to configure UNIX webserver for your business, look no further. If you're looking for an all-in-one NAT router that also doubles as a web and mail server, you'd be better off going with another option, like the Celestix Aries, which received a 9 verdict in September 01.

—WILL SMITH

MAXIMUMPC VERDICT

WebBox 1000
UV NETWORKS

+ MARMET

The WebBox is an awesome webserver—for a small business. An easy to configure UNIX webserver is a great bargain at \$3,300.

- NUTRIA

Anyone who buys one of these things to host a personal web site is smoking crack. This just ain't what you need for light web-hosting duties.

www.uvnetworks.com
\$3,300

8

SONY

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Program AE

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with Auto Exposure Bracketing

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DSC-S85

A great artist can turn the most mundane of subjects into the most compelling of images. A great camera can do the same. With its Carl Zeiss® 3x Optical Zoom Lens, 4.1 megapixel resolution, and flexible exposure controls, the Sony Cyber-shot® DSC-S85 camera lets you compose your shot instantly, in any light. Because there's no film to develop, you're free to experiment — firing off hundreds of shots, keeping the ones you like, deleting the ones you don't. With the Cyber-shot DSC-S85 camera, you will realize there are no bad subjects. Just better cameras. www.sony.com/di

Visiontek Xtasy GeForce4 Ti 4600

We're positively Xtatic over our first retail NV25

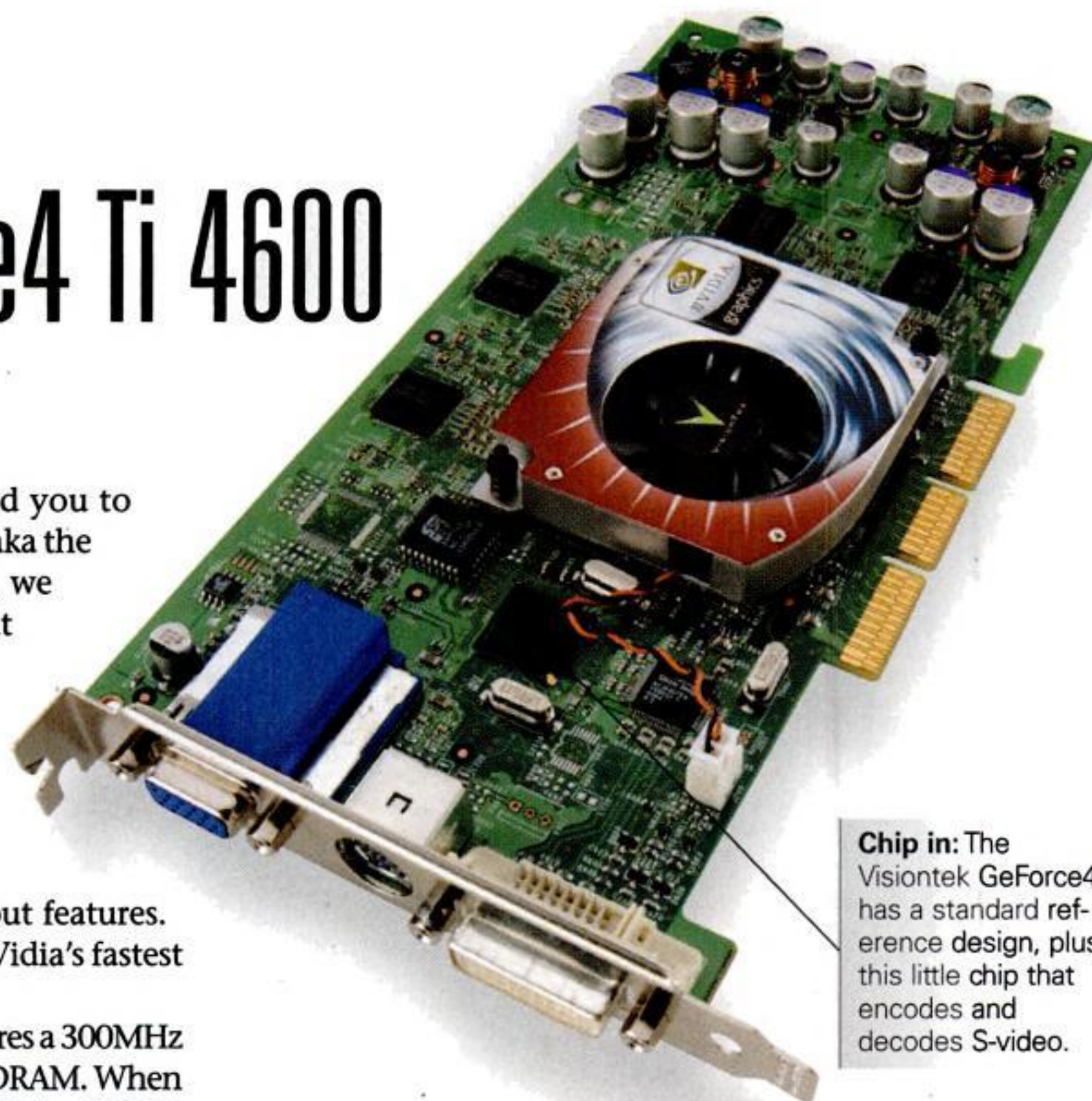
In last month's cover story, we introduced you to NV25—aka nVidia's new GeForce4 Ti chip, aka the world's fastest 3D accelerator. This month, we toss aside all the NV25 reference boards that nVidia sent us for our original report and review the first retail version of the GeForce4 to slip inside our security perimeter. The Xtasy GeForce4 Ti 4600 from Visiontek is one *bad mutha* of a videocard—and, somewhat shockingly, it veers from nVidia's basic reference design by offering spiffy video-in/out features. But first things first. Let's recap what makes nVidia's fastest GeForce4 iteration so special.

Like all Ti 4600 spec'd boards, the Xtasy features a 300MHz core and a whopping 128MB of 325MHz DDR SDRAM. When the superfast core and memory are combined with the NV25's special memory optimizations, you get blistering 3D frame rates that can be maintained even when anti-aliasing is enabled. In case you forgot, anti-aliasing is a feature that helps remove the appearance of jagged edges on otherwise smooth lines. Unfortunately, it's also an incredible memory bandwidth hog. But as you can see from our benchmark results, the Xtasy ran *Quake III* at 96.7fps with 2x anti-aliasing enabled. You can thank the NV25's memory bandwidth optimizations for these more-than-acceptable frame rates.

Just be aware that much more demanding 3D code may not take so kindly to anti-aliasing. For example, in the *3DMark 2001* Game 4 benchmark—an incredibly realistic nature scene replete with wind-rustled trees and volumetric grass—we saw a 33 percent decline in performance when anti-aliasing was enabled. The performance disparity is directly related to memory bandwidth requirements: *3DMark2001* Game 4 is simply much more bandwidth-intensive than *Quake III*. The good news, however, is that Game 4 is a technology demo, while *Quake III* is a shipping game, and a visually complex one at that. For this

reason, you can rest assured that almost every game currently on the market will be able to run very, very quickly on the Visiontek Xtasy with anti-aliasing enabled. Word: If you buy the Xtasy, toggle on Quincunx anti-aliasing instead of the vanilla 2x mode whenever possible—your visual quality will look noticeably better and our benchmarks showed it to be no slower than 2x AA.

If anti-aliasing and raw speed don't happen to light your candle, you might still want to buy the Xtasy GeForce4 Ti 4600 for its connector options. Along with the standard VGA-out interface, the card includes a DVI interface for connecting a



Chip in: The Visiontek GeForce4 has a standard reference design, plus this little chip that encodes and decodes S-video.



flat-panel LCD display. Like all NV25-based boards, you'll be able to use both connectors at the same time to set up a multiple-monitor rig. You can even use a DVI-I-to-DB-15 adapter to connect two CRTs. Visiontek also added a video-in/out connector that allows you to capture and output video when running the bundled copy of Cyberlink *Power Director*—or the video editing suite of your choice. Mind you, the Xtasy isn't as flexible as an ATI All-in-Wonder (hey, it doesn't include a TV-tuner), but it's definitely more versatile than the average dedicated gaming accelerator.

It's worth noting that the Xtasy's DDR memory is packaged in a new ball-grid array (BGA) formfactor. The BGA packaging lets Visiontek crank memory clock speeds all the way to 325MHz (up from 250MHz on GeForce3 Ti 500 boards). When coupled with nVidia's new GPU/memory cooler, the BGA memory packaging precludes the need for heatsinks attached directly to the memory. That said, we weren't able to reliably overclock the Xtasy while still maintaining stability, but we also couldn't find any appropriately sized heatsinks to try cooling the RAM further. When we have new developments on the GeForce4 overclocking front, we'll let you know. When paired with heatsinks, the Xtasy's BGA memory might be an overclocker's dream.

Should you upgrade to the Xtasy GeForce4 Ti 4600? It all depends on what you currently own. GeForce3 and Radeon 8500 owners won't see any performance improvements with the new Xtasy—unless they run games with anti-aliasing enabled. However, owners of older cards, along with hardcore gamers who want multi-monitor setups, should definitely consider this new contender from Visiontek. Simply put, this card has everything: power, features, connector options... *everything*.

—WILL SMITH

MAXIMUM PC VERDICT

Xtasy GeForce4 Ti 4600
VISIONTEK

+ THE ADDAMSSES

Unparalleled 3D power, a DVI connector, and video-in/out.

- THE MUNSTERS

What more could we ask for? HDTV-output, perhaps?

www.visiontek.com

\$400

10

SPECS

Core	300MHz NV25
Memory	128MB, 325MHz DDR SDRAM
Transistors	63,000,000
Connectors	VGA, DVI, S-video in/out

XTASY GEFORCE4 TI 4600 BENCHMARKS

	Quake3 MaxPC	3DMark2001 Game 2 High Detail	3DMark2001 Game 4 Nature	3DMark overall default settings
No AA	106.3fps	87.2fps	31.8fps	9835
2X AA	96.7fps	62.2fps	22.4fps	8338

NOTE: All tests were run on our videocard test bed, a 2.0GHz Pentium 4 Northwood with 512MB of RDRAM. We hate geese.

PlexWriter 40/12/40

Learn why you should yearn for the power-burner's burner

CD-recordable drives have matured. There, we said it. Today's burners can fill up a CD in three and a half minutes and rip a full CD's worth of audio in less than three minutes—speeds that were unimaginable when most people bought their last burners. And just six months ago, we were whining about the trouble 16x and 20x drives were having reading the extremities of pressed CDs—but, alas, these aberrations seem to have been eliminated.

So how can CD burners possibly improve? Leave it to Plextor to provide the answer.

At first glance, the PlexWriter presents a familiar conundrum. It's a fantastic drive with record-breaking potential, but, like previous iterations, it remains hobbled by lame software. For example, the bundled Roxio *Easy CD Creator* burned a 647MB disc in a relatively slow four minutes. But when teamed with Ahead's *Nero*, the Plextor 40x completed the burn in 3:35. The same differential turned up in our 647MB CD rewriting test: 7:14 using *Easy CD Creator* and 6:48 using *Nero*.

Once the "Roxio penalty" is removed, the PlexWriter starts flexing its muscle. It chewed through a 75:27 of CD audio tracks like Pac-Man, ripping an entire CD (without errors) in 2:29. Near the end of the disc, extraction speeds reached 41.7x—that translates to 7MB/sec!

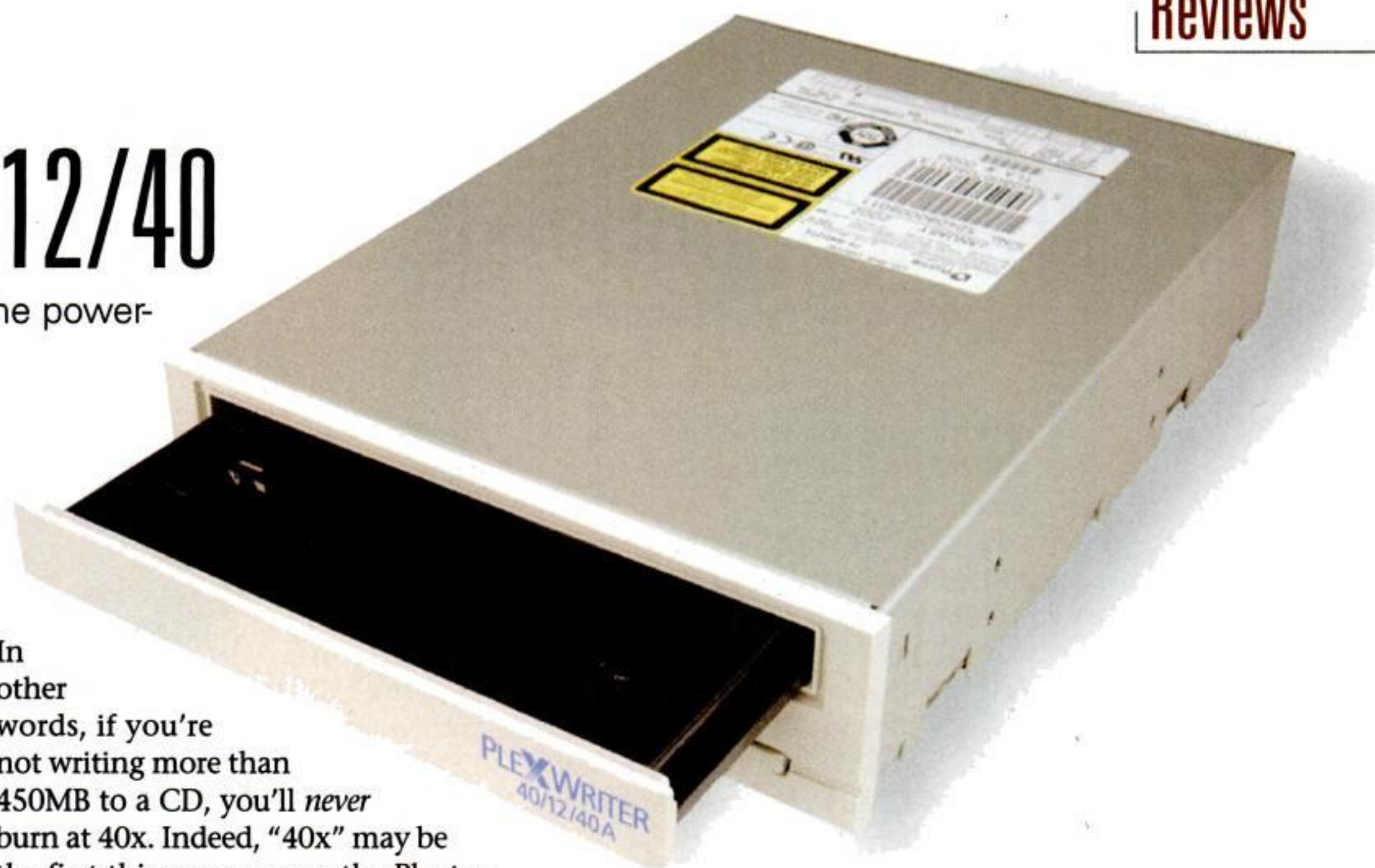
Of course, you can *ooh* and *aah* all you want, but in the end, we're talking about a speed advantage of just a few seconds over a 32x burner. That's because 40x writing occurs only in the fourth (and final) Zone-CLV writing zone, which begins about 450MB into a CD.

In other words, if you're not writing more than 450MB to a CD, you'll *never* burn at 40x. Indeed, "40x" may be the first thing you see on the Plextor box, but it's arguably one of the least interesting things about the new PlexWriter drive.

All of which leads us to Plextor's sharpened focus on quality. In the fanatical quest to reduce error rates, Plextor has introduced optimized PCB circuits near the power supply to provide cleaner power to the drive (based on the premise that unreliable, noisy power equals crappy discs). Plextor also made its CD tray black, a color which absorbs more laser light and allegedly results in reduced error rates. The Plextor's audio CD recording is also self-governed to 24x. Plextor tells us that higher burn speeds simply induce too many errors, which diminishes audio quality as well as disc compatibility in older players.

But the most interesting tweak is a new feature called VariRec. While all CD players and media are created within rigid specifications, minute variations in their manufacturing can lead to incompatibility between certain media and certain players. Your burner can't adjust itself to conform to these variations. Plextor's can. VariRec allows the power user to subtly tweak the strength of the laser that burns the disc in order to compensate for finicky players and cheap media. VariRec won't guarantee you'll be able to create the Universal Disc we read about in the Bible, but it does allow you to do what all power users want to do—experiment.

Believe it or not, the *Plextor2000 Manager* software that ships with the drive isn't compatible with Windows XP! Plextor is working on an update, but one ought to have shipped with the drive. Or better yet, Plextor should have just included *Nero* and dropped



Make mine a double: Plextor just taught an old CD burner a new trick—VariRec lets you adjust the strength of the PlexWriter's laser according to taste.

THE BUNDLE

PlextorManager 2000, Roxio *Direct CD*, Roxio *Easy CD Creator* (basic), *Stomp Click 'n Design* (trial)

everything else in the existing bundle. Another gross oversight is that VariRec isn't yet supported by *Easy CD Creator* (we tested it with *Nero* version 5.5.7.6). So VariRec is out of reach and unusable out of the box. D'oh!

For these reasons—and the fact that 40x burning, as implemented in Zone-CLV drives, simply isn't a big deal—we can't recommend the PlexWriter for anyone who already has a 20x or faster burner. Nonetheless, Plextor has demonstrated that no small tweak or adjustment is too esoteric or anal in its pursuit of the perfect CD burner.

—LOGAN DECKER

BENCHMARKS

Average data transfer (MB/sec)	4.7
Average drive rating	31.79x
Random/full-stroke seek (ms)	116/210
Audio extraction (min:sec)	2:29
Data CD burn (min:sec)	3:35
CPU utilization (at 8x)	5%

NOTE: The audio extraction test uses a commercially stamped 75:27 minute audio CD. The data-CD burn test uses the bundled applications to create a 647MB CD-R. For more information on how we benchmark optical drives, look at the Mag Reprints section of MaximumPC.com.

MAXIMUMPC VERDICT

PlexWriter 40/12/40A
PLEXTOR

+ MAGNIFIQUE

In addition to being one of the fastest burners on the planet, the PlexWriter allows a power user to have unprecedented control of the burn process.

- MERDE

However, a power user will need better and more up-to-date software than Plextor provides.

www.plextor.com

\$210

8

Hard Drives II: Battle at 120 Gigabytes

IBM and Western Digital compete for the IDE crown

Ever since Western Digital's "special edition" 1000JB hard drive scored a Perfect 10 verdict in our March 2002 issue, we've been waiting for IBM to deliver a proper response. That response might very well be the new IBM 120GXP. But can Big Blue's latest-greatest compete with Western Digital's newest update, the 1200JB? Both drives run at ATA/100 and boast 120GB of storage, but the IBM includes a 2MB cache while the Western Digital offers 8MB.

Western Digital 1200JB

When the Western Digital 1000JB took our Lab by storm we couldn't help wondering what Western Digital



would send us next. And then sauntered in the new 1200JB, a'prancing and a'strutting like some kind of prize-winning hog. Western Digital's platter density has been improved to match the 40GB-per-platter of the IBM 120GXP, and the 8MB buffer that made the 1000JB so special has carried over to the 1200JB as well (you can opt for a 2MB version to save some dough).

During benchmarking, the new Western Digital kept pace with its Big Blue counterpart through most of the tests, but fell behind in our new *RamDisk* benchmark. The 8MB buffer is

a huge plus for A/V geeks, but it doesn't help much in raw, day-to-day file transfers. *Premiere* and *SYSmark2002* didn't seem to favor either drive, which indicates that raw transfer speeds

are rarely a bottleneck in everyday application performance. Nevertheless, the Western Digital turned in some outstanding scores, and its 120GB of storage is the most you can get from a 7200rpm hard drive.

If you do a lot of video capture and you don't have the bankroll for SCSI, then go out and buy this drive right now and never look back. Otherwise, you might want to take a peek at the IBM 120GXP.

IBM Deskstar 120GXP

The IBM 120GXP is the successor to the 60GXP and 75GXP before it. Like the 60GXP, the 120GXP uses a three-platter strategy, but doubles the density of the platters from 20GB to 40GB. Disappointingly, the cache buffer is still stuck at 2MB.

Still, the IBM didn't seem to be handcuffed by its smaller cache and absolutely schooled the Western Digital in our *RamDisk* benchmark, posting 10 percent better scores on the read test and 13 percent better writes. In *SYSmark2002* and *Premiere* the drives were dead even, scoring almost identically to one another. We're not exactly sure how the IBM managed to hold an advantage over the Western Digital despite its smaller cache; we can only assume that IBM's engineers did some serious optimizations on this feller.

Performance-wise, we're giving the crown to the Deskstar, but we're a bit concerned about the reliability record of IBM drives. This wasn't helped by a report on the Internet that the 120GXP should be run for only 333 hours a month—suggesting that IBM believes that the drive should be powered on no more than 11 hours a day in order to flawlessly perform throughout a five-year lifespan. IBM assures us this is a normal power-on spec among hard drive vendors, and that all it has done as a company is actually publish the spec to help people understand normal usage



Even though the Western Digital 1200JB looks like the 1200BB, its shell conceals an enlarged 8MB cache.

patterns. IBM says you can indeed run the 120GXP 24/7, but like any mechanical device, it may effect its lifespan. Two other drive makers we talked to say the power-on spec is normal and it's fine to run their drives 24/7 (see page 21 for details). Regardless, we're still concerned about IBM's latest drive, so we'll subject it to long-term testing. But for now, the IBM 120GXP demonstrates incredible performance, and for this it rightly deserves to be considered Kick Ass.

—JOHN TUMMINARO

IBM Deskstar 120GXP:
Could 10,000rpm hard drives be right around the corner?



DARE TO COMPARE

	IBM Deskstar 60GXP	Western Digital 1200JB	IBM Deskstar 120GXP
RamDisk Read	35 sec	23 sec	21 sec
RamDisk Write	34 sec	27 sec	24 sec
SYSmark2002	202	205	206
Adobe Premiere output to AVI	378 sec	358 sec	360 sec

Best scores are bolded. We included scores for the IBM 60GXP for the sake of comparison. Test bed configs were 2.0 P4 Northwood, Intel 850 Motherboard, 1 GB Kingston PC800 RDRAM, Visiontek GeForce3 Ti 500, Creative SB Audigy, Windows XP Professional with Detonator XP 23.11, Intel Chipset Drivers and Intel Application Accelerator.

MAXIMUMPC VERDICT

1200JB
WESTERN DIGITAL

+ PLANET OF THE APES (1968)

It's extremely fast, roomy, and has a nice 8MB of cache that no other IDE hard drive vendor on the planet has managed to duplicate.

- PLANET OF THE APES (2001)

Well, ATA/133 support would be nice.

www.westemdigital.com

\$300

9

MAXIMUMPC VERDICT

Deskstar 120GXP
IBM

+ THE TIME MACHINE (1960)

It's faster than all hell and it holds a spacious 120GB of data.

- THE TIME MACHINE (2002)

The 2MB cache might be a limitation under some circumstances and the 333-hour monthly power-on recommendation has us worried.

www.ibm.com

\$300

9

A Trio of Hardware Treats

Mice both big and small, and a backup for your power supply

Logitech's Optical Mini Mouse

Let's face it: Trackpads suck, and pointing sticks are for hicks. So what makes Logitech's hors d'oeuvre-size mouse any better? Despite the Mini Mouse's unextraordinary 1500 samples-per-second sampling rate, the serious laptop ninja will appreciate the mouse's ability to track with precision not just on desks, but also on rough and uneven surfaces.

Secondly, at just over three inches long and a mere two ounces in weight, the Mini Mouse was easily steered in tight spaces with our thumbs on the rump and our index and middle fingers poised atop the buttons. The scroll wheel offers just the right amount of resistance to turning, and the firm pressure required to click the wheel guaranteed that we wouldn't click on it accidentally.

Finally, viewed slightly off-center, the Mini Mouse resembles the head of Geiger's Alien.

That said, our glee is somewhat tempered by the fact that it still can't keep up with the accuracy and speed of a desktop ball or optical mouse.

+ **VERY GOOD THINGS:** The ultralight Mini Mouse tracks better than any other portable mouse we've tried so far.

- **VERY BAD THINGS:** It still doesn't track as well as many desktop mice. Being on the go remains a tough proposition.

MAXIMUMPC VERDICT: 7

\$30, Logitech, www.logitech.com



APC Back-UPS Office 500VA

When the power goes out and you lose 45 minutes worth of work because you didn't regularly hit Ctrl-S, there's no one to blame but yourself. But for just \$100, you can virtually guarantee that power outages will never become a source of your PC-related woes. The 500VA uninterruptible power supply features six power plugs—three with battery-backup capability and three that provide only surge protection. This lets you plug your printers, speakers, and other nonessential hardware into the surge-protected outlets, while leaving three outlets for your PC, monitor, and any other peripheral that will work for a short time even if the power is out.

We tested the Back-UPS Office 550VA with our 2.0GHz Pentium4 test bed system, and it lasted five minutes and 50 seconds without primary outlet power (we even played some games during our brief window of opportunity!). Six minutes is more than enough time to shut down all your apps and turn off the computer in the event of a power outage.

+ **HYDROELECTRIC:** Convenient formfactor and plenty of juice.

- **NUCLEAR FISSION:** In the past we've had more reliability problems with this formfactor than the conventionally shaped UPS, but our testing didn't show any problems with the new Office model.

MAXIMUMPC VERDICT: 9

\$100, APC, www.apc.com



—WILL SMITH

Microsoft Intellimouse Explorer 3.0

The latest version of a venerable classic kicks ass

Mouse preference is an intensely personal choice. Everyone likes different things in a mouse, but the two things everyone demands are consistency and accuracy. Early versions of optical mice were unable to track accurately when the mouse was moved rapidly. The newest version of the Microsoft Intellimouse Explorer, version 3.0, is a much needed enhancement to the second generation of optical mice.

In case you didn't know, optical mice use a small light and a tiny camera on the bottom of the mouse instead of a ball and mechanical sensors. The camera compares key areas in your mousing surface as the mouse moves, and moves the cursor to correspond with the mouse's movement. The problem with older optical mice was that the user was able to move the mouse more quickly than the sensor on the mouse could update, and the mouse lost track of its new position relative to the last frame it captured. This caused random motion of the cursor and made it difficult to play games that require precise mouse control. The sensor on version 3.0 of the Intellimouse Explorer is able to update 6,000 times per second, as opposed to the 2,500 frames per second on earlier revs. The result?

We weren't able to get the Intellimouse Explorer 3.0 to lose track at all.

Everything else about the new Intellimouse Explorer is as it

FACTOID

The Intellimouse Explorer 3.0's optical sensor can update 6,000 times per second!



Is this the perfect mouse? Awesome tracking, a comfortable shape, and optical convenience in a slick silver package.

should be. There are five buttons, a wheel, and six whopping feet of mouse cord. Microsoft even listened to our complaints about the large size of the older Intellimouse Explorers. Version 3.0 is much more suited to a smaller-handed mouser. The only thing this mouse lacks is Immersion force feedback technology.

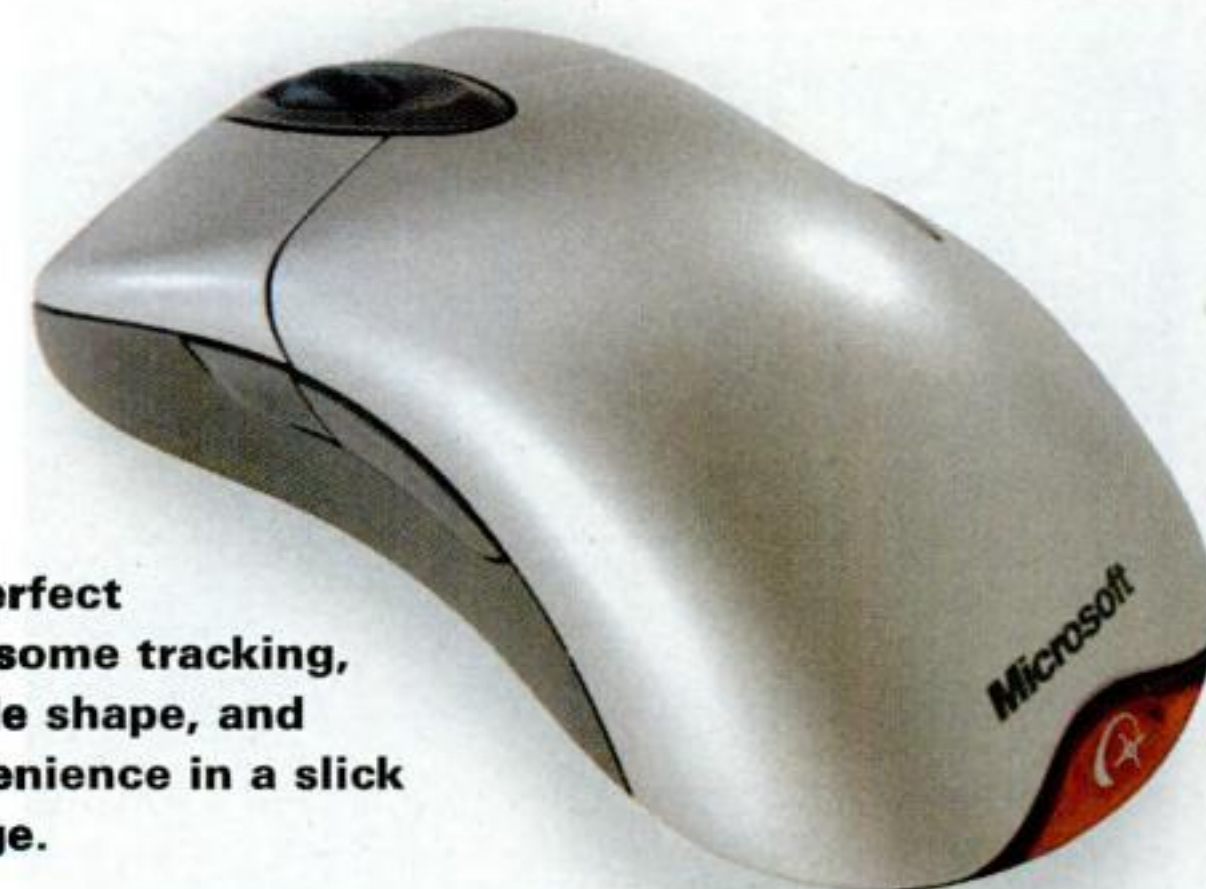
+ **SIDESHOW BOB:** Awesome tracking with only one optical sensor, and a tidy package will make even the most stalwart mechanical mouse user trade in his rodent.

- **BOB SAGAT:** Our only real complaint about this mouse is that it doesn't have force feedback technology.

MAXIMUMPC VERDICT: 9

\$55, Microsoft, www.microsoft.com

—WILL SMITH



Video Editing Revisited

Pinnacle and Magix pick up where Ulead left off

You probably already know that Adobe *Premiere* is the Cadillac of prosumer-level digital video apps. Trouble is, at \$550 it also costs as much as a monthly Cadillac payment. Not to worry, though: A bunch of low-priced editing apps are available to serve DV bottom-feeders. You can spring for chump change, right?

PINNACLE STUDIO 7

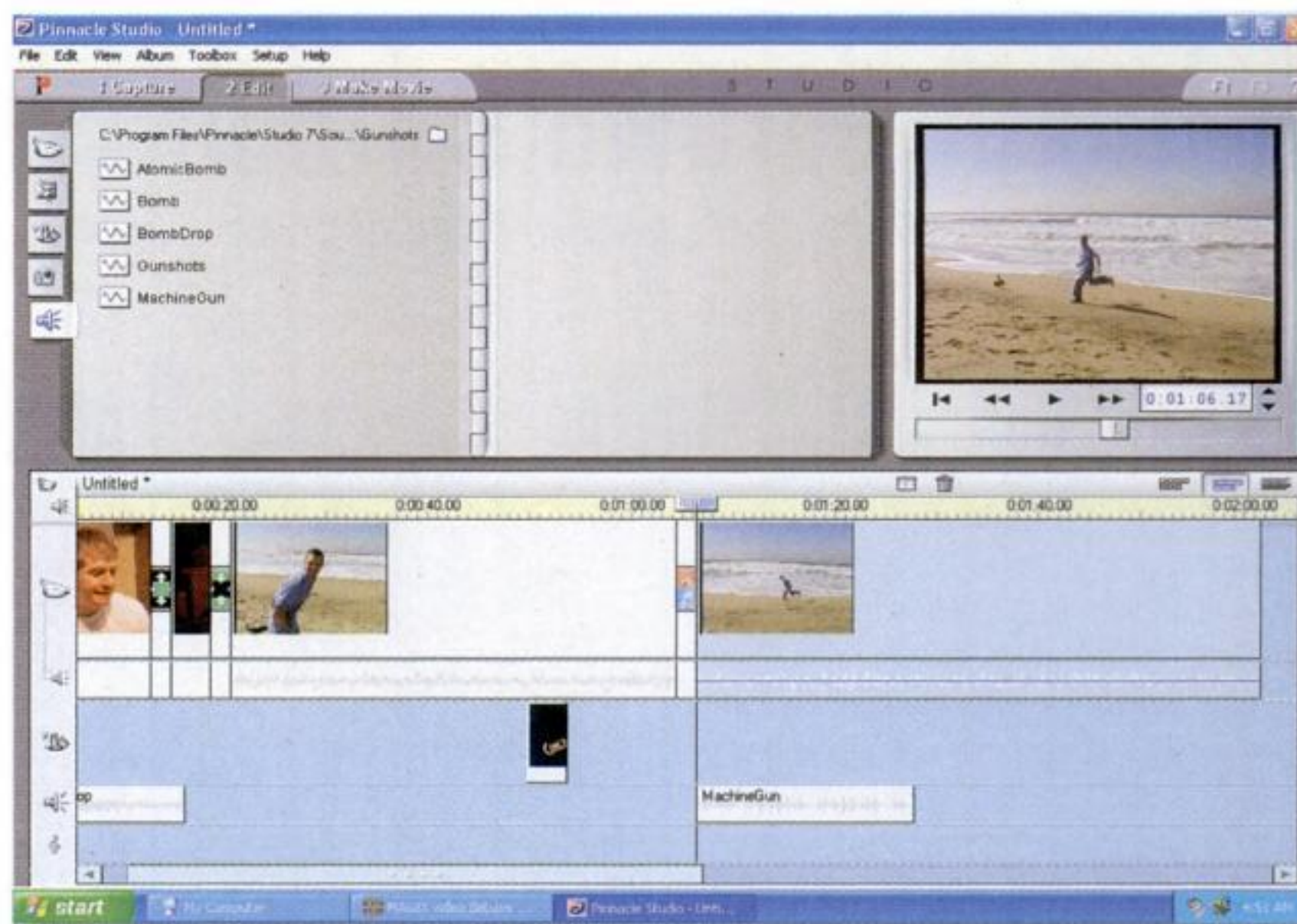
For low-level editing chores, we would gladly dump Adobe *Premiere* for *Studio 7*. The key to any good video editing program is its interface, and this is where Pinnacle's entry truly excels—its GUI is so simple, even someone who's daunted by Microsoft Bob could instantly pick it up. The *Studio 7* editing process is divided into three simple steps: Capture, Edit, and Make Movie. The Capture procedure is standard fare, save for the addition of an excellent scene detector, which splits captured video into individual scenes for easy editing. After Capture, you move onto Edit mode, which puts a host of cool effects at your fingertips—you can adjust color balance, brightness, saturation, and other basic visual



How many timelines does *Video Deluxe* have, anyway?

properties. In this mode, you also have the chance to add titles, 3D transitions, a music track, and a commentary track, as well as view your work in realtime previews. The Make Movie mode simply outputs your edited work to your final format of choice.

Output options are fairly basic, with one big exception: The Pinnacle-designed MPEG2 codec included with *Studio 7* boasts exceptional visual quality. In fact, it's on par with codecs that individually cost more than *Studio 7* itself! Sure, it's a bit slower than competing codecs, but we'd gladly wait a few extra minutes for the best-looking video possible.



Studio 7: So simple even Mr. Rogers could use it.

The only problem we had with *Studio 7* was its lack of integrated DVD-authoring software. Regardless, the software's excellent user interface and downright amazing MPEG2 codec make it an excellent purchase. It doesn't offer *Premiere's* precision editing features, vast plug-in support, or realtime hardware support, but, hey, it costs just a hundred bucks.

MAGIX VIDEO DELUXE

Video DeLuxe bundles in some of the most complete video and audio tools we've seen outside of dedicated programs such as *After Effects* and *Reason*. But compared to *Studio 7*, the *Video DeLuxe* interface is complex: The software gives you no fewer than 16 editing timelines, each of which can be assigned to manipulate a different media element, be it a video clip, audio track, transition, special effect, whatever. *Video DeLuxe* also ships with a huge assortment of complex audio and video effects, but its basic tools are still completely intuitive.

The app's Video FX engine allows you to add the usual assortment of visual tweaks such as gamma, mosaic, and emboss, along with more exotic effects such as Fish-Eye lens, Blur, and Soften. We especially liked the rotary control, which allows you to rotate the position of your video, à la the footage of "enemy lairs" in the "Batman" TV series. But the Audio FX engine is what really separates *Video DeLuxe* from the pack. You get a full equalizer, a compressor, reverb, a denoiser/dehisser, and more.

Video DeLuxe is robust with effects, but its sheer speed is what really blew us away. Its realtime previews are totally smooth and devoid of stuttering, and

you can add effects in realtime, even while the timeline is playing. This is absolutely unprecedented in the world of video editing, and it's safe to say that *Video DeLuxe* will probably be the most fluid video editor that you've ever used.

The app's MPEG2 codec, while decent enough, isn't up to *Studio 7's* standards. For software that costs just \$50, this is understandable, but disappointing nonetheless. *Video DeLuxe* also lacks a VCD/DVD authoring component. Still, despite these flaws, it's an excellent video-editing tool and would make a fine purchase for A/V freaks looking for more advanced tweaking than what *Studio 7* offers.

—JOHN TUMMINARO

MAXIMUMPC VERDICT

Studio 7
PINNACLE SYSTEMS

+ GOODNESS

You can create a stellar movie without a Ph.D.

- BADNESS

We would really like to be able to write to VCD/DVD without buying more software.

www.pinnaclesys.com

\$100

9

MAXIMUMPC VERDICT

Video DeLuxe
MAGIX ENTERTAINMENT CORP.

+ METHINKSTHISISGOOD

It's cheap and has some of the best tweaking tools we've ever seen.

- METHINKSTHISBLOWS

The MPEG2 codec needs improvement, and the interface can be daunting for beginners.

www.magix.com

\$50

9

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Command & Conquer: Renegade

The C&C universe goes first-person-shooter—and gets a bit soft in the head

Ever wonder what a Mammoth tank looks like up close? How about a Nod Obelisk, or any of the other vehicles and buildings from Westwood's *Command & Conquer* series? Westwood finally brings the GDI/Nod conflict to first- and third-person 3D in *Renegade*. The premise is simple: The Brotherhood of Nod is doing weird things with Tiberium, and it's up to you to figure out what the hell's going on. You play the role of Nick "Havoc" Parker, the gung-ho GDI trooper who began his career in the original C&C.

You get 11 single-player missions, and they're all standard fare: run-and-gun, find-and-escort, seek-and-destroy. A docket of just 11 missions sounds pretty sparse, but the single-player portion of the game is actually satisfyingly long thanks to primary, secondary, and tertiary objectives sprinkled liberally throughout. The difficulty of individual missions varies widely, with some of the hardest being the escort operations, thanks to the game's dumb-as-a-cinderblock, *Daikatana*-like AI. There's nothing like trying to escort an unarmed scientist to safety only to have him charge into a pack of chaingun-wielding Nod soldiers. It's AI like this that'll have you smacking the quickload button—that is, if the game *had* a quickload button. It doesn't (but at least you can quicksave). The enemy AI, meanwhile, is spotty to the extreme, ranging from insanely accurate snipers to mentally disabled grunts à la *Daikatana*'s hapless Superfly Johnson. Oh well, at least their stupidity allows you to mow 'em down easily, which is a good thing because they'll come at you in swarms.

While the first two C&C chapters were realtime strategy games, *Renegade* is an action shooter, and Westwood's done an amazing job with clever event scripting that adds to the game's battlefield atmosphere. Attack choppers whiz overhead. Tanks and buggies roll down narrow streets. Nod troopers rappel down buildings, parachute from cargo planes, and shimmy down ropes dangling from transport helicopters. In short, enemies constantly crawl out of the walls and drop from the sky. But don't worry—

you're extremely well-armed, packing everything from an automatic pistol to beacons that call down destruction from orbit. And you're not limited to hoofing it, because you have access to six different fighting vehicles. They all have intuitive controls, consistent handling, and turrets that move independently from their chassis. You can squish people with them, too!

Multiplayer is something special. As far as gameplay goes, it's like an "RTS lite" in which everyone on your team plays in the same unit. You buy weapons, vehicles, and upgrades from the relevant buildings, but just as in the RTS versions of C&C, you need to keep your assets intact to enjoy the benefits. Someone blows up your power station? Prices will go up, and your automated defenses drop. Because each building has a distinct and valuable



Blowing up APCs is fun. Especially when they're full.

function, you need to protect them all. The best part is that the buildings are scaled perfectly and look exactly how you imagined them when you were playing the first two C&C installments.

The graphics engine is a new Westwood original, and while it's no *Quake III Arena*, it does the job and runs respectably even when cranked up to 1600x1200x32 on a 1.3GHz Athlon GeForce3 Ti 500 system. Textures are crisp and bright, and fine details are intricate and convincing, especially on the character and vehicle models. Unfortunately, clipping is a *huge* issue. Vehicles can get hung up (and permanently stuck) on just about everything except people, and bounding boxes are hit-or-miss. But you won't get stuck while battling a pack of Nod troopers—most times, you'll just walk right through them as if their polygons were nothing but air.

With its over-the-top voice acting and heavy-handed dialogue, *Renegade*'s cheese factor is high. But at least it fits well with the bright colors, clearly-drawn "good guys vs. bad guys" spiel, and action-hero pacing. With a more advanced game engine and acceptable AI, *Renegade* would be a winner. But as it stands, you'll probably get frustrated with the single-player missions halfway through and jump straight to the small-scale, realtime multiplayer battles for the best of the *Renegade* experience.

—BILL
MCCLENDON



GDI is dropping some buddies off—like you need help.

MAXIMUMPC VERDICT

Command & Conquer: Renegade
WESTWOOD/EA

+ THRILL OF VICTORY

Faithful to the C&C universe, tons o' killing, and you get to squish Nod troops with their own tanks. Multiplayer is all that and more.

- AGONY OF DEFEAT

Clipping issues, terrible AI, no quickload. "Boss" monsters are formulaic, and enemies sometimes spawn out of control.

www.westwood.ea.com

\$50

7

A Trio of Writerly Widgets

Tools for tools

Maximum PC's dirty little secret is that for every hour an editor spends in the Lab, at least two hours are spent writing in front of a computer screen. So while a screwdriver and stopwatch come in handy from 10 a.m. to noon, a robust installation of Microsoft *Word* better fits the bill from noon until the 6 p.m. whistle.

If you're itching to make your own version of *Word* more powerful, check out these three software freaks. We auditioned all of the applications extensively, on several machines with different iterations of Windows, and found no problems. In short: If you're looking for valuable writing tools, these three Kick Ass apps are among the best.



WordWeb

Sure, Microsoft *Word* comes with its own thesaurus, but there have been plenty of times when we've longed for something more comprehensive. For example, a thesaurus that throws in near-matches in addition to synonyms. And while we're asking, how about a program that provides definitions and even anagrams?

You can find all these features in *WordWeb*, a handy little plug-in that hooks directly into *Word*'s interface. Its database is extensive. For example, *Word*'s default thesaurus brings up just



WriteExpress Rhymers delivers the rhymes you need, right to your computer's doorstep, come rain or snow.

six synonyms for the word "hobby," and two of these results ("fad" and "relaxation") aren't synonyms at all, but near-fits. *WordWeb*, however, brings up seven near-fits and nine exact matches, including rocking horse (which is a synonym for hobby horse) and the erudite entry *Falco subbuteo*—a bird known popularly as the "hobby."

WordWeb's penetration might seem like overkill, but it's the little extras that make the program so much more than just an exceptionally good thesaurus. Suppose you need to know the chemical symbol for an element or the genus of a plant—just type the word, apply *WordWeb*, and check out the accompanying definitions. And unlike *Word*'s thesaurus, it's easy to alter or add to the program's entries. Just click the Edit menu. In short, the app is easy to use and is packed with usefulness.

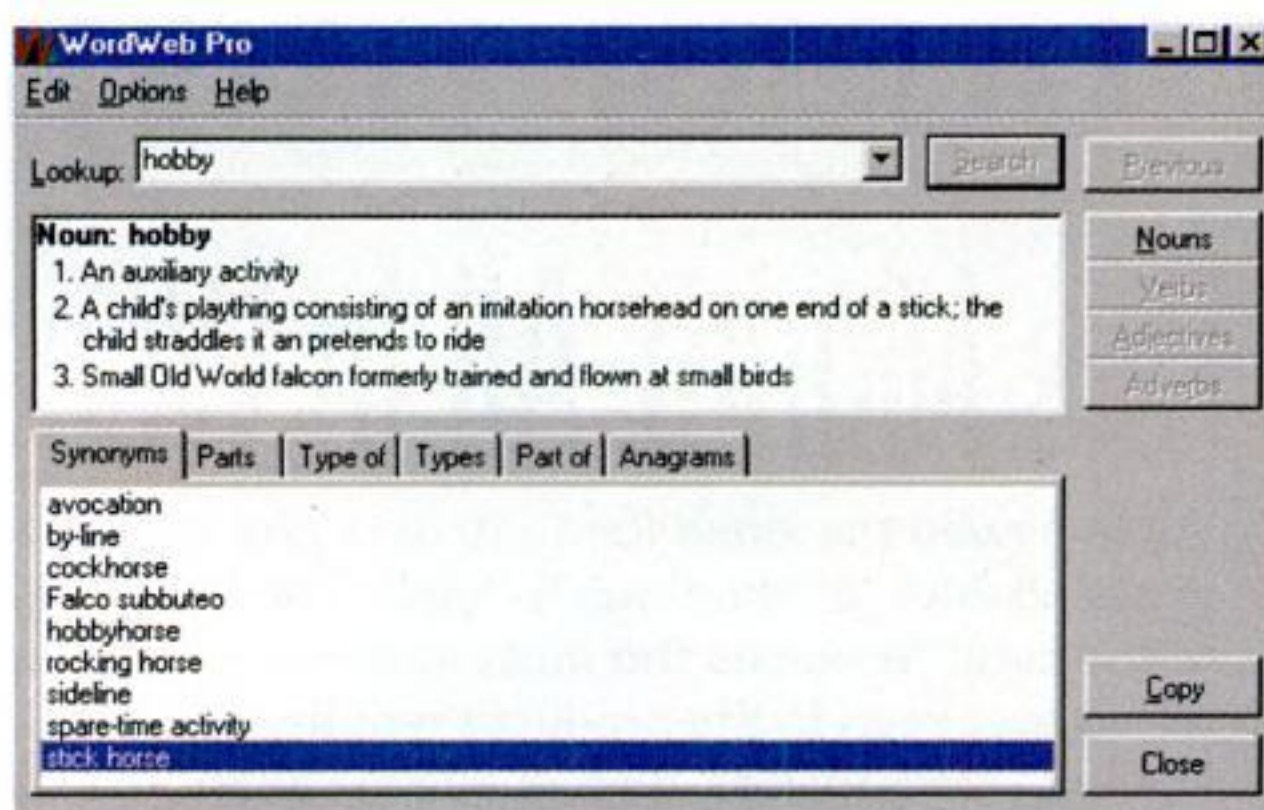
MAXIMUMPC VERDICT: 10

\$18, www.wordweb.co.uk

Accent Composer

One *Word* feature that incites a lot of grumbling is symbol insertion. We're talking about accents, umlauts, and the unfamiliar script you might find in, say, Arabic or Cyrillic language. To its credit, *Word* includes these symbols under the Insert/Symbol menu, but it doesn't offer keyboard shortcuts for anything save portions of the extended Western script. This is where *Accent Composer* comes in handy. The app loads into your System Tray and runs in the background, but does not integrate itself into *Word*. To activate it, you simply hold down a key, then enter a specific keyboard shortcut. Symbol sets include Western, Arabic, Cyrillic, Greek, Turkish, Baltic, and Central European.

The program uses many of the same basic key combinations as *Word*—it just offers so many more. Each symbol set comes predetermined, but you can modify existing sets and shortcuts, add new characters, and export and import sets. You'll find the program to be an invaluable tool for research papers, and even for regular communications with contacts



For elaborate definitions, tons of synonyms, and even anagrams, WordWeb can't be beat.

whose names include diacritics.

MAXIMUMPC VERDICT: 9

\$25, www.kovcomp.co.uk

WriteExpress Rhymers

You're taking a brief break from work. *Solitaire* doesn't interest you, *Asteroids* is so 20th century, and if you see another *Hearts* screen, you may scream. What's left... except to write a poem?

This may not precisely describe your situation, but we have to declare that there's no better tool for finding rhymes than *WriteExpress Rhymers*. It integrates seamlessly with *Word* and shows up under the Tools menu. As with the other products reviewed here, it's the depth of this little program that impressed us the most.

You can configure

it to supply beginning or ending rhymes, rhymes for the first syllable, or rhymes for the last one, two, or three syllables. If a word you've supplied has multiple pronunciations, the plug-in will list the variants and ask you to choose which one you want. Options let

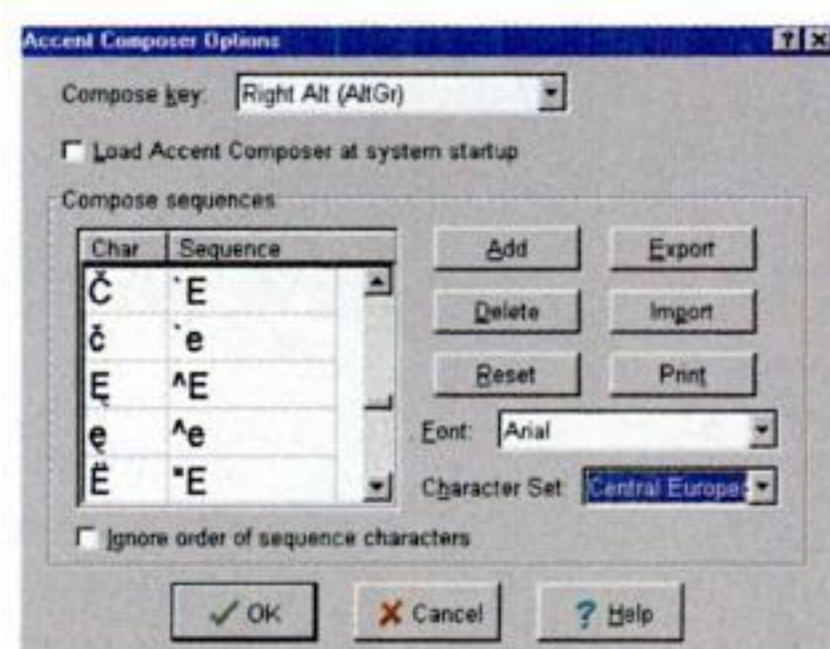
you limit the number of letters and syllables in all rhymes. You can insert a single rhyme directly into *Word*, or copy entire rhyme lists you've generated into text files, but, unfortunately, the app doesn't let you edit its database.

Just one request: Don't let this powerful tool fall in the hands of the *Maximum PC* headline writers!

MAXIMUMPC VERDICT: 9

\$25, www.rhymer.com

—BARRY BRENESAL



Accent Composer will help you add that accent circumflex when you most desperately need it.

Reader Reviews

Buy it, try it, and tell us what you think

This Month: All-in-Wonder Radeon

We reviewed the latest iteration of the All-in-Wonder Radeon in March 2002. At the time, Technical Editor Will Smith said of the card: "It boasts the most impressive technical chops we've ever seen in the product's lengthy and venerated lineage." Nonetheless, he had qualms about the card's slow

memory, the less-than-responsive default speed of the remote control's mouse, and a very specific chipset/memory bug that has since been fixed with a driver update. In the end, we awarded the card an 8 verdict. But let's see what our A-i-W Radeon 8500-owning readers have to say...

Zero for Two

I built the ATI 8500 into two new rigs. The first was designed to replace my current office machine, while the second was to become the center of my new entertainment center. In both installations, the card failed miserably.

With a Toyo Dragon with RAID support (for a total of 250GB disk space), the ATI card would play DVDs only haltingly and would not play back the 5.1 sound on any DVD. I

avoided the remote control at first, as I thought that might be the problem, but after doing a full install of all the software, then all the patches, the problem was only worse and the remote control abysmal.

On the positive side, the video captured with the 8500 was of higher quality than the old 7200 card, of which I'm still a fan.

However, it was dropping frames more frequently than the older card.

On the new office machine, with an MSI K7Master motherboard (with SCSI), the ATI software prevents the machine from booting. This is an acknowledged problem on the ATI web site, but even after installing the latest drivers and software, the machine still will not boot.

The hardware looks solid and promising. The software looks a mess, and the remote control really isn't necessary with a remote keyboard or keypad.

—EDWARD REASOR

Kinda Sorta

To sum it up: The video quality and gaming rendering is very good, the drivers are poor and scarce, and the tech support is poor. This card cannot compare to my previous Matrox G400 in terms of 2D desktop dual-monitor stability, speed, and drivers. Hopefully the 8500 will really start to shine once true DirectX 8 games start to arrive.

—BROCK NUBILE

Double the Pleasure

I am running the card on two machines. One is a P4 1.6GHz, the other is a P4 2.2GHz Northwood. I like the way it runs in both systems. I have seen insane frame rates in *Quake III Arena*, as well as in *3DMark2000* and *3DMark2001*. And as far as your review saying "the mouse on the remote is wonky," I really don't know what the hell that means, because I love it. I have noticed that if you don't firmly hold it down, then it's a little slow moving, but if you are firm with the round-shaped mouse-control pad and point it where you want it to go, it moves, no doubt about it.

I must admit, I have not mastered every damn button on the remote—there are so many, it rivals some Sony home-receiver remotes. Performance-wise it's been great. Every game installed so far has run without a catch.

—MILO HAJEK

It's Got Game

My previous computer had an nVidia TNT2/Ultra. So, needless to say, the performance difference left my jaw on the

floor and drool on my keyboard.

All those "GeForce3" games, such as *Aquanox*, ran wonderfully and looked gorgeous. I haven't found anything in my collection that didn't run properly, indicating that ATI has got the OpenGL and DirectX 8 API's down pat.

Performance-wise, only *Giants: Citizen Kabuto* was able to make the card stutter (with all the video options maxed and total pandemonium in the scene).

The DVD playback looked like a cheap, overused videotape, and tweaking the settings didn't improve things.

All in all, I am still very pleased with this card. It's stable, works great, looks great, and is relatively cheap.

—AUGUSTE DACCARETT

All-in-Wonderful

I love this card! Installation was easy, and the drivers haven't let me down yet. I'm running this card on a P4 running Windows XP. For great graphics, easy video editing, and TV recording, this card has more to offer than any GeForce card. The most-used option on this card is recording TV shows on our hard drive. ATI offers a free service that allows you to download a digital TV guide, and you can schedule automatic recording for up to a week. The only downfall is that you have to keep your machine logged on to allow the schedule to run. As for video editing, we recorded our 27 VHS tapes and transferred them to CD, making them VCD to watch in our DVD player. The best feature of all is the radio remote control. It allows you to not only control taped movies, but also to control everything else in Windows. My only wish is that ATI would include a feature to automatically skip commercials, because the fast-forward can be a little slow.

—BRIAN KERLIN



HERE'S HOW YOU CONTRIBUTE...

If you own one of these products and would like to contribute, send an e-mail to owneropinions@maximumpc.com. Name the precise name/model number of your gear and include a descriptive, detailed, 300-word review of your most significant likes and dislikes. Include your real name, because *Maximum PC* reviewers don't use pseudonyms!

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Star Trek: Bridge Commander

Federation command simulator may knock loose your toupee

You know *Star Trek: Bridge Commander* is doing its job when you begin to involuntarily rock in your chair when your starship is being hammered by weapons fire. It's that much fun.

Developed by Totally Games under the helmsmanship of *X-Wing Fighter* creator Lawrence Holland, *Bridge Commander* is a complete departure from the typical space shooter that has you piloting nimble fighters that juke around with ease. Instead, Holland's development team chose to emulate the ponderous movement of capital ships during battle—and, in the main, they accomplished their goal.

As the captain of the Galaxy-class U.S.S. Dauntless, you play *Bridge Commander* by swiveling around in your helm and issuing orders to your bridge crew. Some scenarios present you with simple yes/no decisions, such as deciding whether to engage in battle or to simply drop your shields to prove to the Romulans that the Federation has no intentions of waging war. But most of the time, you find the Dauntless warping around the quadrant, following up on clues and getting into skirmishes with those radish-headed Cardassians.

During battle sequences, you can take a mostly hands-off approach. For example, after you order your tactical officer to disable a target ship's system, you can simply grip the sides of your helm and monitor the attacks while making small command changes. But if you get the itch to micromanage a battle, you can jump to a mode that lets you manually direct fire and steer the lumbering Dauntless. As Captain, you'll also need to prioritize the ship's



Bridge Commander's intuitive interface provides you with precise control over your starship.

power and damage control teams. Thankfully, *Bridge Commander* keeps your role in this to an executive level; this isn't a hands-on battle simulator, after all.

Graphically, *Bridge Commander* is true to the Star Trek universe; you won't see any graphics or special effects that you wouldn't see in the TV series. That said, we were blown away by the beautiful exterior shots of rendered starships. Complete with specular-highlights, external fly-bys of the Dauntless are breathtaking. And if you've always thought that anti-aliasing was a farce, *Bridge Commander* is proof that the effect can markedly improve visual quality. We found that with AA turned off, the jagged, "stair-stepped" look of the ship graphics chafed us more than a cheap Ferengi suit.

However, Net-Immerse (the graphics engine used for the bridge scenes), could have been much better. When you're at the helm, the graphics look too cartoony—more *Quake II*-era than state of the art. Even worse, during combat we found several clipping problems with characters stationed on the bridge.

Despite any graphical flaws, *Bridge Commander* succeeds where *Starfleet Academy* was a miserable failure. We haven't seen this many editors blast

each other to pieces since *Medal of Honor* came out. Heck, our intern even created a new maneuver—the Tumminaro Suicide Dive. Expect to see it in Starfleet training manuals by stardate 2437.9.

Die-hard Star Trek tech freaks will be disappointed by the sparse number of Fed ships available, though *Bridge Commander* may be able to compensate for this with an assist from the mod community. Even before the game was released, fans had created new character uniforms and bridge layouts available for download.

Bridge Commander gave us a lot to get excited about, and it's the sum of all its parts that make it one of the better Star Trek games to date. Early on in the game, Captain Jean-Luc Picard appears on the bridge to help your transition from first officer to captain. It's a powerful moment as Picard orders the crew to prepare for departure; you can almost believe that you're sitting on the bridge of a starship, preparing for adventure.

—GORDON
MAH UNG



The fly-by shots will blow you away. We especially liked the porthole lights that twinkle in realtime.

MAXIMUMPC VERDICT

Star Trek: Bridge Commander
ACTIVISION

+ KLINGON CLEAVAGE

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- TASHA YAR ACTING

The story line isn't the Inner Light.

www.bridgecommander.com

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9

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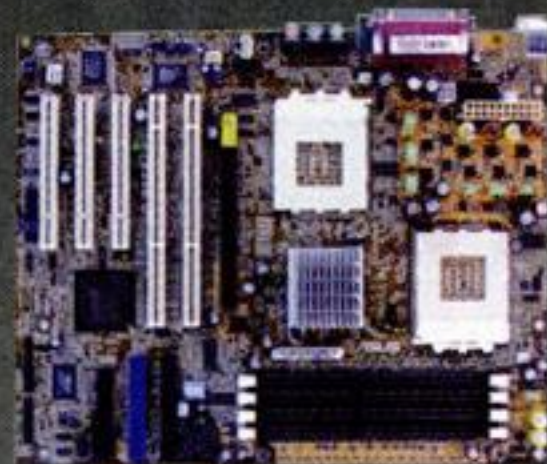
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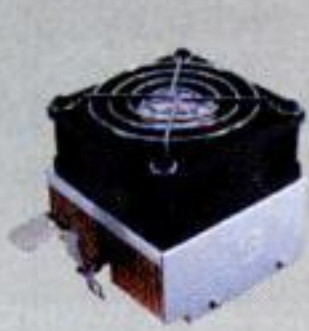
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Maxtor	40GB	External 5400rpm Retail	\$184
Maxtor	60GB	External 7200rpm Retail	\$259
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Maxtor	160GB	External 5400rpm Retail	\$368
QPS	60GB	Ultraslim 7200rpm Retail	\$242
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Yamaha	20x10x40	CRW2200FXZ Firewire	\$306
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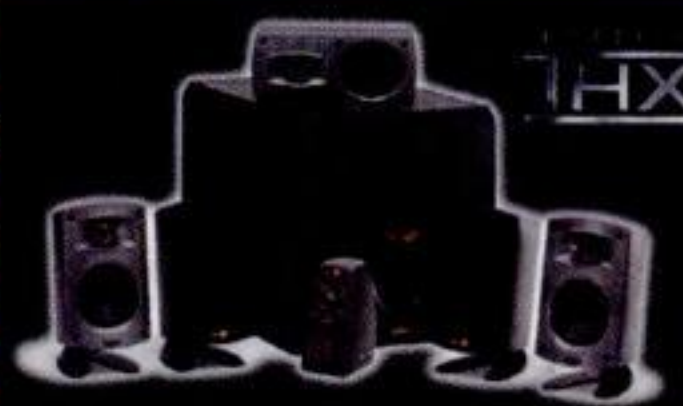
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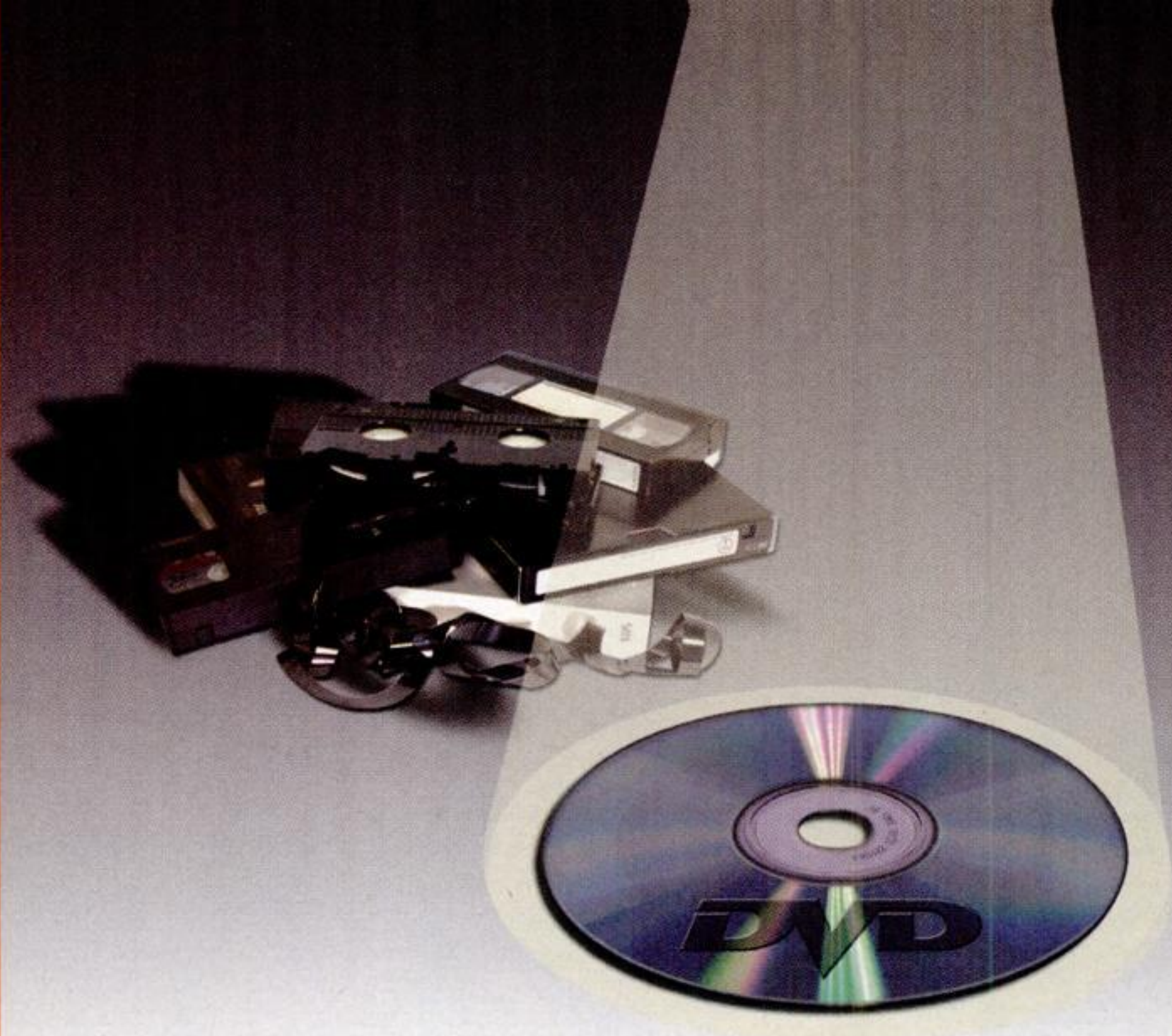


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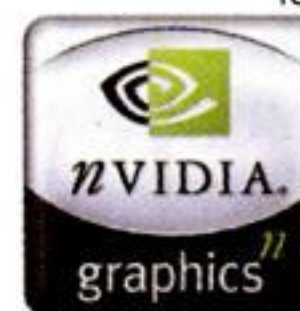
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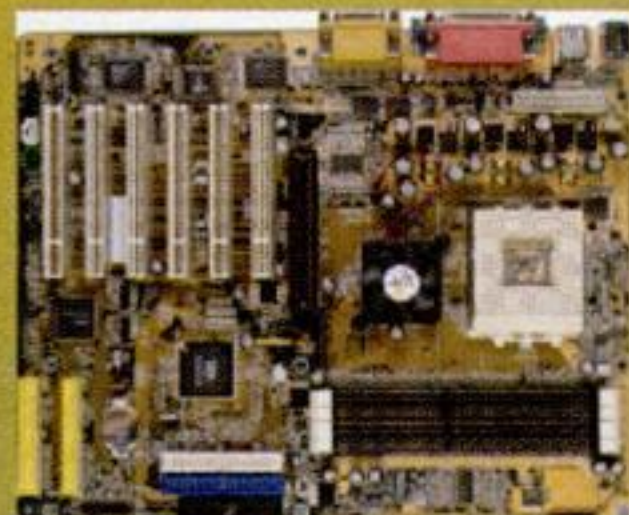
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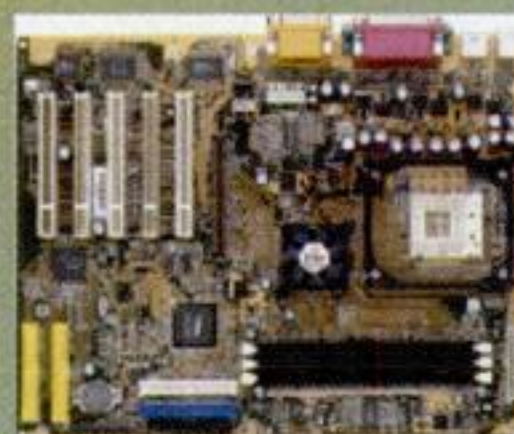
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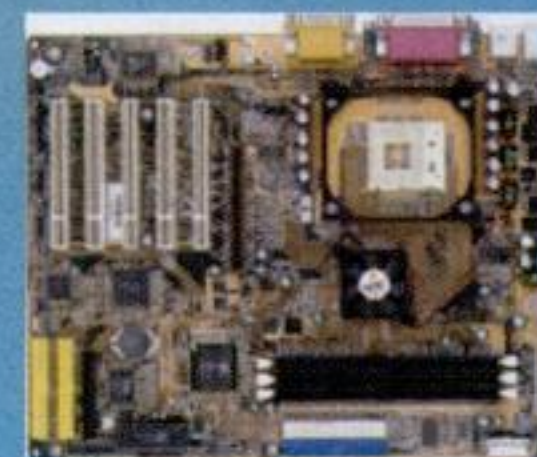
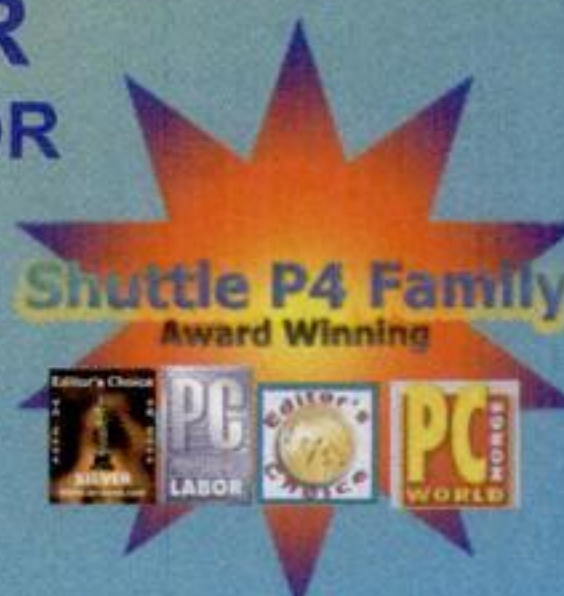
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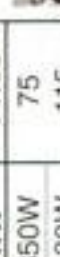
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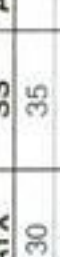
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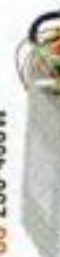
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105L/PX socket 370	255	12x13x3.1	PS2 KB, mouse, VGA, USB, RJ-45, 2x IP AUDIO, GAME	1	1/1	3	0 or 0
105L/PX TV	275	12x13x3.1	PS2 KB, mouse, VGA, USB, RJ-45, 2x IP AUDIO, GAME, TV	1		3	0 or 0
107S/37	395	5.75x6.2x1.9	PS2 KB, mouse, VGA, USB, RJ-45, 2x IP AUDIO, GAME	15mm	0/1 slim	0	0
111M MLX 370	260	11.5x10.16x2.5	PS2 KB, mouse, VGA, USB, RJ-45, 2x IP AUDIO, GAME, 1394		within CD 02 x 140	2	0 or 0
192 M ATX 370	185	13.8x16.5x3.4	PS2 KB, mouse, VGA, USB, RJ-45, 2x IP AUDIO, GAME	1	1/1	3	0 or 0
192B M ATX 370	185	13.8x16.5x3.4	PS2 KB, mouse, VGA, USB, RJ-45, 2x IP AUDIO, GAME	1	1/1	3	0 or 0

Case Specification & Price List

Model	Price	Dimension W.D.H.	MB Size	5.25 Ext./In.	3.5 Ext./In.	P.S.
R02/BARE	180/300	19x17.6x3.5	M,ATX	1/0	1/1	150W
R04/BW	275	19x24.3x3.5	ATX	1/0	1/3	250W
R05B	430	19x24x3.5	ATX	1/0	1/4	430W
R06B	250	19x20.2x3.25	ATX	4/0	1/5	300W
R08 BW	1550/1800	19x22x3.5				
R14 BW	215	19x21x7	ATX	3/0	1/3	300W
R15	295/510	19x24.4x7	ATX	6/0	2/2	300W
R16 BW	225	19x18x7	ATX	3/0	1/2	250W
R17 B 4U	215	19x21x7	ATX	3/0	1/2	250W
R20 BW	275	19x20.5x7	ATX	8/0		300W
R21 BW	275	19x18x7	ATX	8/0		300W
R26R/BW	630/850	19x22.6x10.7	ATX	4/0	2/4	300W/R
R28	290	19x17x8.7		8/0		300W
RSP	18	5.8x9.3x1.6			1	
RSM169-100	65/75	5.8x9.3x1.6			1	
001B	75	10x11.5x3		1/0		60W
001B1	85	8.3x10.6x2.8		1/0		50W
002B	88	6.9x14.6x5.8		2/0		60W
002B1	108	7.5x11.2x6.5		2/0		80W
004B	75	6.8x15.3x9.3		4/0		230W
004B1	100	7.5x17.3x10.2		4/0		200W
007B	180	8.4x20.2x18.3		7/0		250W
008B	280	8.4x20.2x18.3		8/0		300W
008B1	180	7.5x17.9x17.1		8/0		250W
008LPX/IV	255/275	11.9x12.6x3	LPX	8/0	1/1	90W
107 bare	395	5.7x5x6.2x1.9			1slim,00/1slim	
111N bare	260	11.6x10.6x2.5	M,NLX	1/0	0/1	100W
192M,ATX/B	85	13.1x16.5x3.5	M,ATX	1/0	1/1	150W
224	75	17.4x18.8x6.1	ATX	3/0	2/2	230W
267	70	16.8x16.8x6.2	ATX	2/0	2/1	250W
271	85	17.3x15.9x5.5	ATX	2/0	1/1	250X
304	75	16.9x17x6	ATX	3/0	2/1	230W
304	70	7.9x18.8x13.9	ATX	3/0	2/1	300W
325B	55	8x18.5x17	ATX	3/0	2/1	235W
338	55	7x14.7x13.8	M,ATX	2/0	2/1	145W
366	50	7.2x15.5x14.3	M,ATX	2/0	2/1	235W
367	55	7.7x16.5x17	ATX	3/0	2/1	235W
370	80	8.3x17.3x16.1	ATX	3/0	2/2	250W
372	80	7.5x17x17	ATX	3/0	2/2	250W
393	90	8.5x17x17.5	ATX	6/0	1/1	250W
401	110	8.5x17.3x18	ATX	2/0	2/2	250W
404	105	7.8x18.8x17	ATX	4/0	2/2	320W
405B	75	7.8x17.5x17.2	ATX	4/0	2/2	320W
409	295	9.5x22x18.1	ATX	4/0	2/5	300W
411	67	7.2x17.2x16.8	ATX	4/0	2/1	250W
413BL	67	8.5x19.5x18	ATX	4/0	1/2	250W
415	75	8.8x19.5x19.7	ATX	4/0	1/0	300W
418BW	115	8.1x18.8x21.4	ATX	4/0	1/4	300W
424	70	7.7x16.6x18.1	AT	4/0	1/4	250W
424	70	7.5x18.9x16.7	ATX	4/0	2/1	250W
426BW/S	70/75	7.5x17.5x19.3	ATX	3/0	2/2	250W
427	220	8.5x16.5x17.3	ATX	3/0	2/2	250W
430 BL/BK	220	8.25x19.7x15.8	ATX	4/0	3/6	300W
436	70/85	8.6x18x15.6	ATX	3/0	2/2	250/300W
443	75	8x18.8x17	ATX	4/0	2/2	300W
467	75/90	7.5x16.7x18.8	ATX	3/0	1/4	250W/300W
470	110	8.3x17.3x21.3	ATX	4/1	1/2	250W
471	110	8.4x17.5x21.3	ATX	3/1	1/4	250W
472	60	7.5x18x17.6	ATX	4/0	2/2	250W
474	285	7.8x17.2x17.2	ATX	4/0	2/2	300

Model# Starts with:

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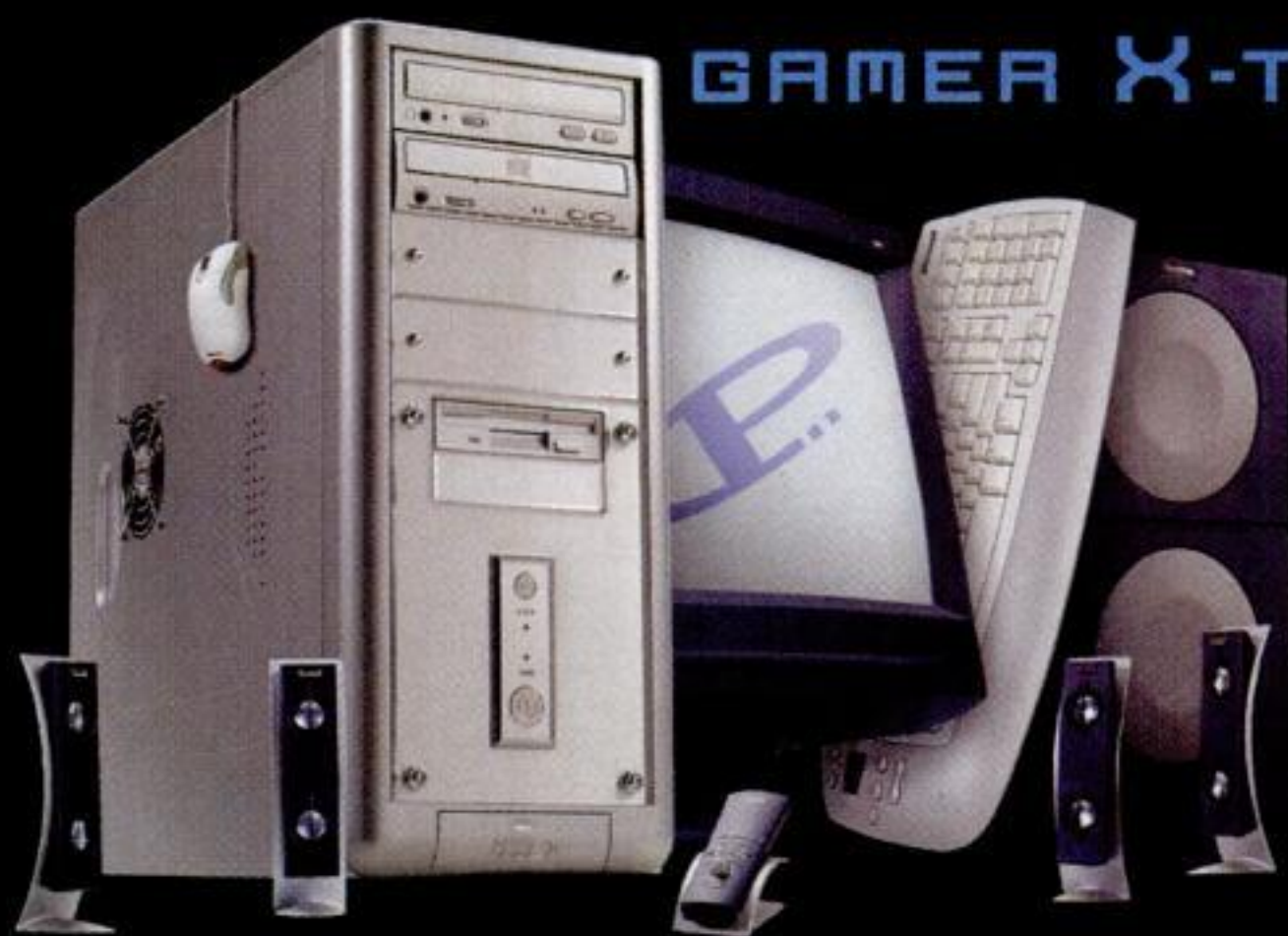
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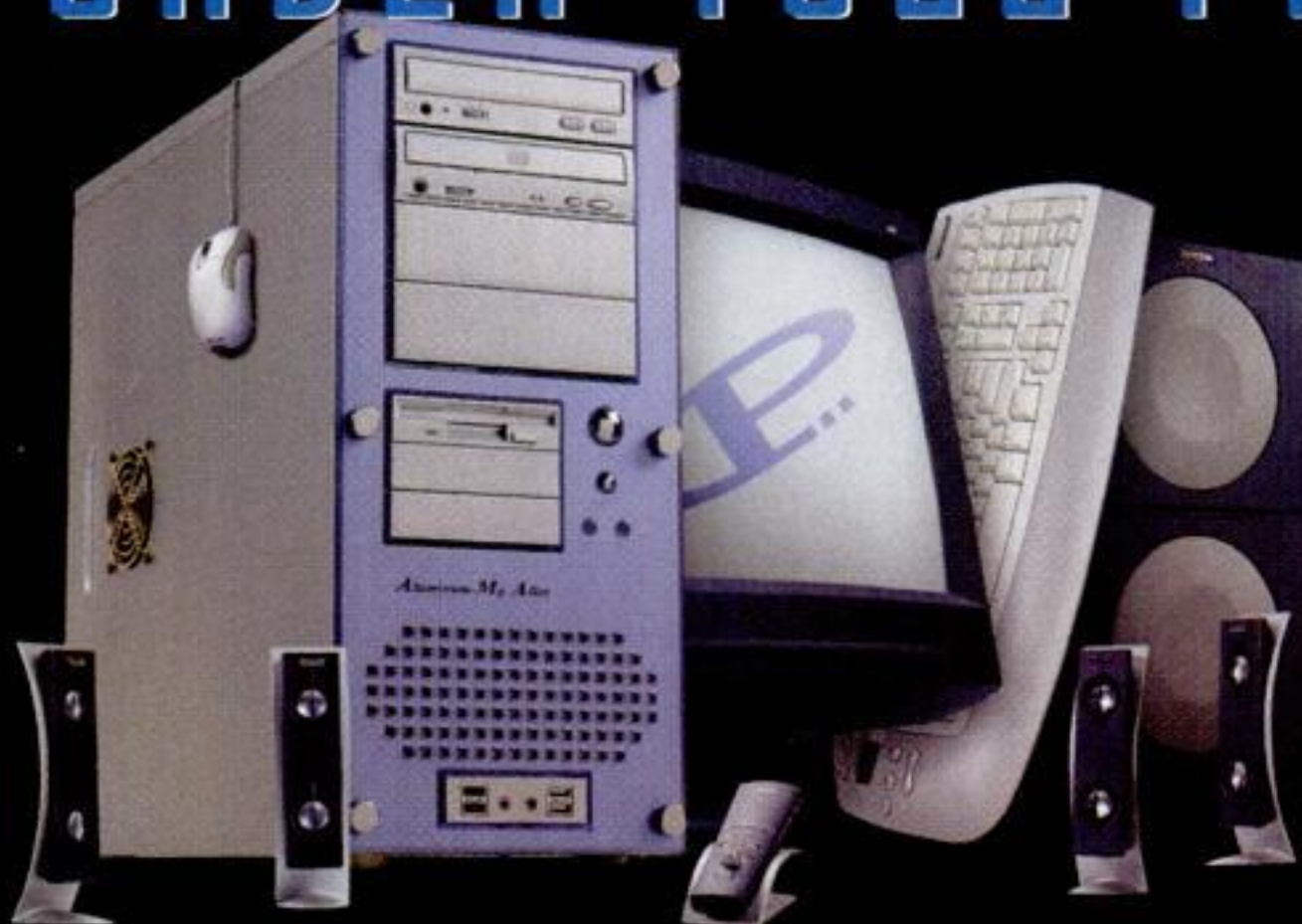
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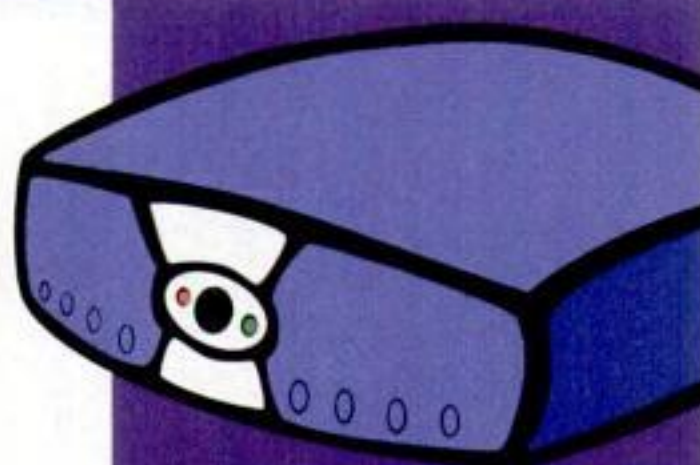
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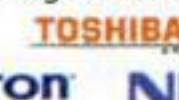
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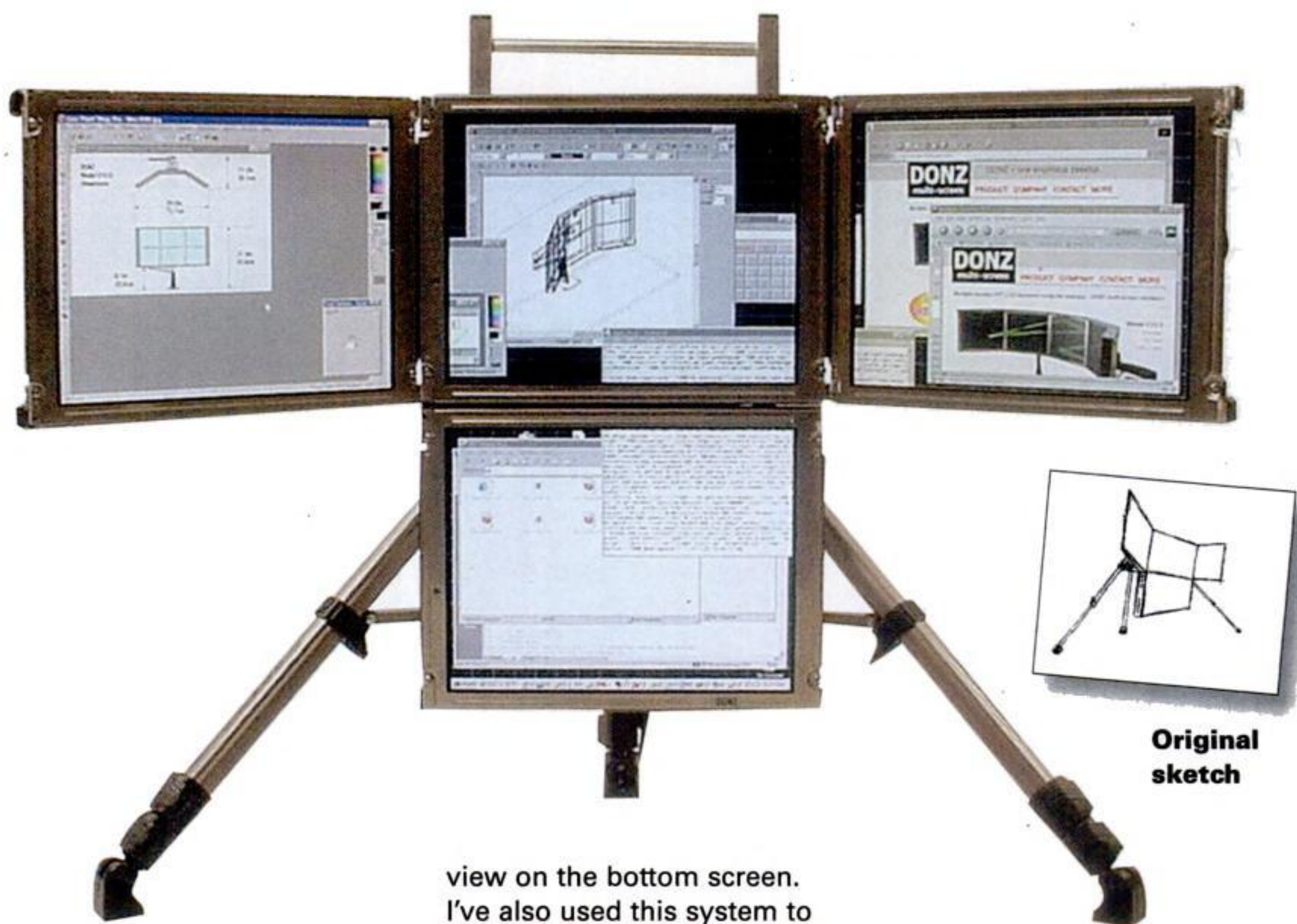
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MAXIMUMPC Rig of the Month

THIS MONTH: Don Lindsay's Mars Lander

If a picture tells a 1,000 words, then what we have here, folks, is, uh... 4,000 words. But at least the Mars Lander communicates its intent the moment you see it. This extreme multi-monitor rig runs Win98, four ATI Xpert 98 videocards (one AGP, three PCI), and four 13.8-inch LCDs that were completely gutted for the experiment at hand. And as you can see from the photo, the four displays share the same Windows desktop, across which a single mouse cursor skates hither and yon.

Don Lindsay—a Centerville, Utah computer consultant—came up with the idea when he was working at a virtual reality R&D lab: "The notion of an immersive, wraparound display system constructed from a mosaic of LCD panels came to me on a moonless winter night in late 1997.... The next day I built a 16-screen mock-up in my basement, using cardboard rectangles. Over the following weeks, I learned that Microsoft was offering multi-monitor support in its new Windows 98 operating system! This meant that I would be able to use my multi-screen display system with common 2D windowing



applications, and the development of complex, immersive 3D applications could wait awhile."

So what's this thing good for? "The 'T-shape' arrangement is cool for flight sims," says Lindsay. "I've gotten Microsoft's combat flight sim to work with a wide-angle cockpit view spanning the three top screens, and a map

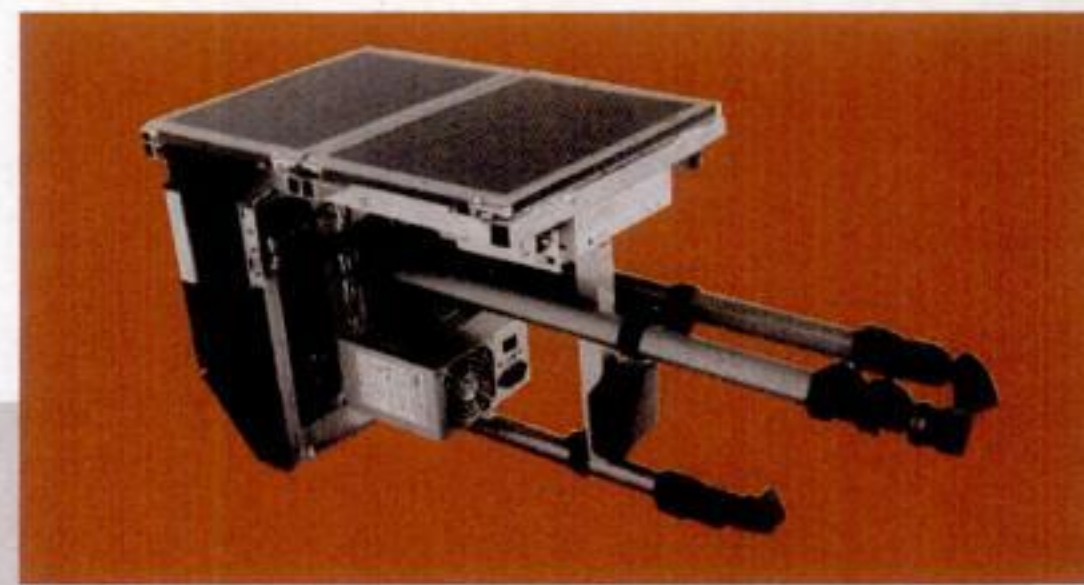
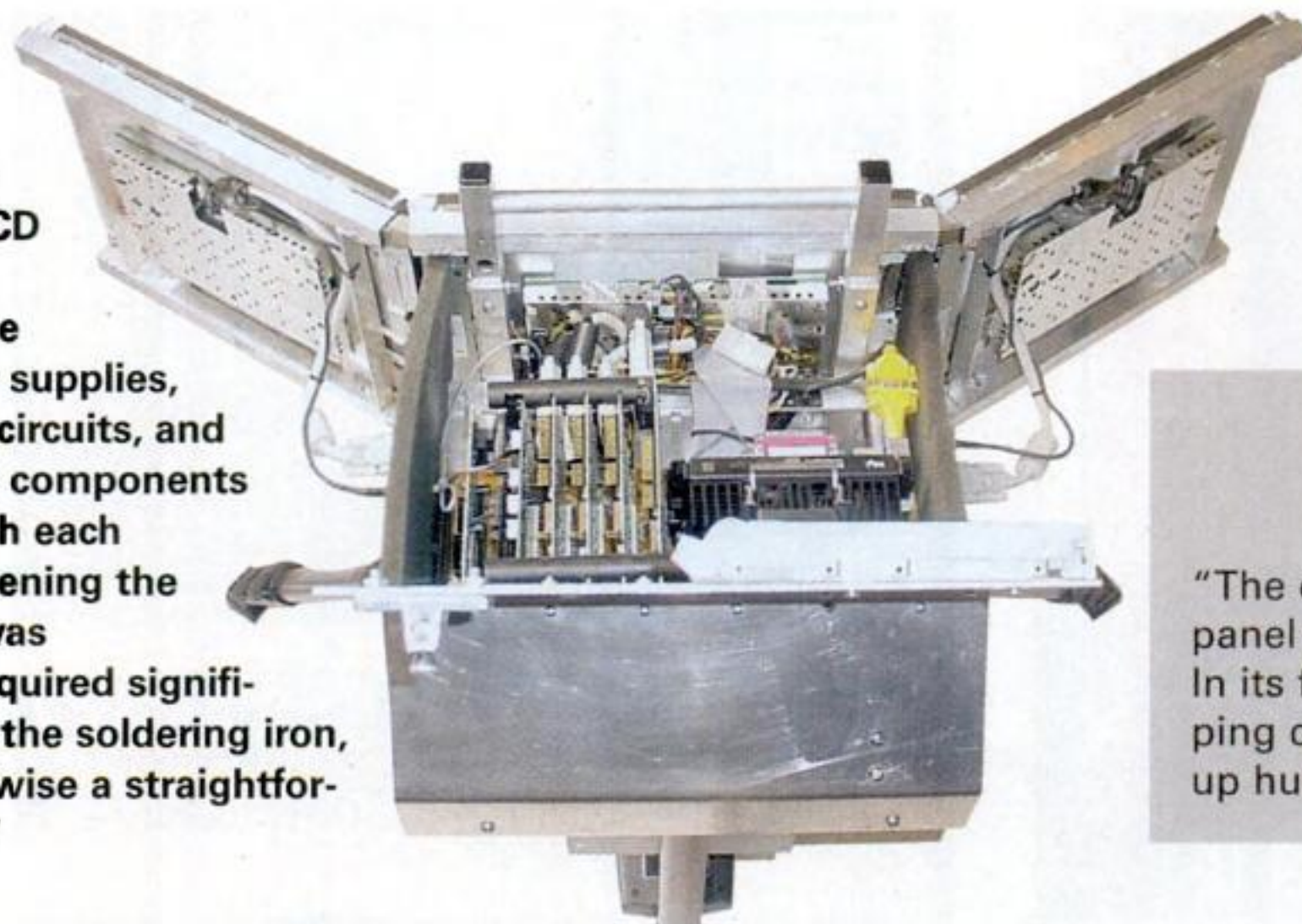
view on the bottom screen. I've also used this system to develop software, create web sites, author multimedia proposals, design 3D models, and write business plans. The layout provides many opportunities to cut-and-paste and drag-and-drop across screens for significant productivity gains. In my opinion, multiple-monitor computing provides the single-most dramatic improvement in 2D computer produc-

tivity since the advent of windowing operating systems."

For the full story on all of Lindsay's multi-mon contraptions (some of which are for sale), go to www.donz.com.

If you have a contender for Rig of the Month, e-mail input@maximumpc.com with pics and a brief write-up.

"I bought four off-the-shelf LCD monitors and threw away the internal power supplies, internal audio circuits, and all plastic case components associated with each monitor. Shortening the video cables was tedious and required significant skill with the soldering iron, but was otherwise a straightforward process."



"The only real non-PC parts are the tripod, the side-panel filters, and the structural frame components. In its folded state, the rig fits into a custom shipping crate. It has been folded up, shipped, and set up hundreds of times—and is still running fine."

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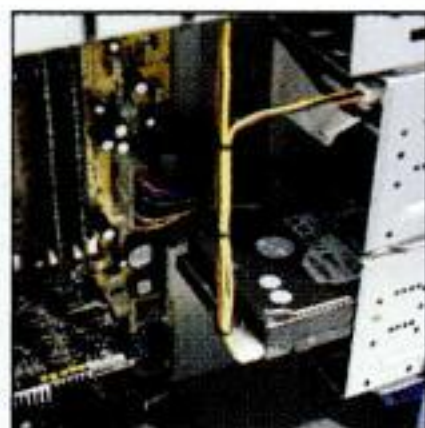


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